EFFECT OF PARTICIPATION IN FARMER BASED ORGANISATIONS ON PROFITABILITY OF PIGEON PEA (*Cajanus cajan*) ENTERPRISE IN MULANJE DISTRICT, MALAWI

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DECLARATION AND APPROVAL

Declaration

This research thesis is my original work and to the best of my knowledge has not been submitted in this or any other University for the award of any degree.

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DEDICATION

To my beloved parents for their love and the sacrifices made for my upbringing. To my wife Tamala, thanks for your love and support.

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ABSTRACT

Malawi's agricultural sector contributes 30% to the GDP and provides employment to more than 85% of the total rural population. The sector is dominated by smallholder farmers who are challenged with lack of access to reliable markets and poor infrastructure. To address this, the Malawian government has encouraged formation of Farmer-Based Organisations in its national development framework. Although Farmer-Based Organisations have been in existence in the country since 1978, access to agribusiness development services by smallholder farmers producing pigeon peas still remains a challenge. Therefore, this study focused on the effect of participation in Farmer-Based Organisations on profitability of pigeon pea enterprise in Mulanje district, Malawi with the objectives being to compare the socio-economic characteristics of members and non-members of Farmer-Based Organisations, to determine the perceptions of farmers towards services provided by Farmer-Based organisations and the effect of farmer participation in Farmer-Based Organisations on the gross margin of pigeon peas. Primary data was collected using a semi-structured questionnaire from 200 members and 200 non-members of Farmer-Based Organisations that were selected using systematic random sampling. To achieve the study objectives, descriptive statistics, gross margin analysis and propensity score matching model were used for data analysis. The members of Farmer-Based Organisations had an average age of 44 years of age and 7 years of schooling, older and more educated than non-members with a mean of 39 years of age and 5 years of schooling. Furthermore, members travelled 65.13 kilometres to market and had a mean gross margin of MK47, 093.12 different from non-members who travelled 12.84 kilometres to market and had a mean gross margin of MK10,129.65. The results also indicate that source of inputs, credit, extension services, training and new agricultural technologies were different between members and non-members at 1 percent level. On perception towards agribusiness service delivery, both members and non-members agreed that FBOs improve access to production, marketing, advisory and financial services required to promote pigeon pea enterprise. Lastly, members of FBOs obtained higher gross margin for pigeon pea enterprise than non-members and the difference was MK25, 621.45 per hectare. Therefore, Farmer-Based Organisations can help to improve farm productivity and farm income, hence, policy makers need to provide more capacity building initiatives to promote efficient delivery of agribusiness services delivery farmers.

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ACRONYMS AND ABBREVIATIONS

ACE	Agricultural Commodity Exchange
AHCX	Auction Holdings Commodity Exchange
ASWAp	Agricultural Sector Wide Approach
BHEARD	Borlaug Higher Education for Agricultural Research and Development
CISANET	Civil Society Agriculture Network
DADO	District Agriculture Development Office
DC	District Council
EPA	Extension Planning Area
FAO	Food and Agriculture Organisation
FBOs	Farmer-Based Organisations
FUM	Farmers Union of Malawi
GDP	Gross Domestic Product
GM	Gross Margin
GoM	Government of Malawi
IFAD	International Fund for Agricultural Development
MGDS II	Malawi Growth and Development Strategy II
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MPRS	Malawi Poverty Reduction Strategy
NAP	National Agriculture Policy
NASFAM	National Smallholder Farmers Association of Malawi
NES	National Export Strategy
NGOs	Non-Governmental Organisations
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
TR	Total Revenue
TVC	Total Variable Cost
WRS	Warehouse Receipt System

CHAPTER ONE

INTRODUCTION

1.1 Background Information

The agricultural sector is the mainstay of the Malawian economy. It contributes up to 30% of the total Gross Domestic Product (GDP). The sector accounts for 80% of export earnings. Moreover, it is a source of employment to more than 85% of the total rural population and it provides food and raw material to non-agricultural sectors of the economy (GoM, 2016).

The agricultural sector in Malawi is dominated by smallholder farmers who are challenged with low productivity and high vulnerability, limited access to markets and poor road infrastructure. In addition, agribusiness in Malawi is in its initial stages as most of the produce is sold as raw materials. This is because smallholder agriculture is associated with less value addition. As a result, smallholder farmers fail to meet the growing demands for agricultural products for both local and world markets (World Bank, 2013). To reduce the negative effect of such challenges, the government has encouraged the formation of Farmer-Based Organisations (FBOs) in its national development framework (Mapila *et al.*, 2010).

FBOs in the form of farmer clubs were introduced in 1978 through the Ministry of Agriculture. The major objective of their formation was for channelling agricultural credit and extension services to smallholder farmers (Kishindo, 1988). This was in recognition that FBOs generate opportunities which enable underprivileged smallholder farmers to access markets, credit, extension services and other limited resources (Sangole *et al.*, 2014).

With the advent of structural adjustment and market liberalisation programmes, the role of FBOs was expanded as they became commercial organisations substituting parastatals in the delivery of agricultural marketing facilities. This was aimed at overcoming the market failures of parastatals as agricultural marketing agencies. However, the development in private sector investment in these services has been unsatisfactory as market failures still continue to exist. This has led to growing calls for more comprehensive market liberalisation strategies to overcome challenges deterring access to markets by smallholder farmers. The strategies comprise of improved investment in; infrastructure, legal institutions, market institutions,

research and extension services. This should be coupled with an improved responsibility of FBOs (Bingen *et al.*, 2003).

An earlier study by Rondot and Collion (1999) shows that the record of FBOs performance is mixed. Some FBOs have made substantial improvements in member's incomes through enhanced access to markets and other services, despite the fact that numerous FBOs have been unsuccessful. This is because some FBOs are weakened by efforts to scale up too rapidly or take several activities. Another reason for failure is the provision of subsidies that lead to a failure to concentrate on fundamental profit making activities that provide more benefits to members. Besides, support from donors and government and the interference by such institutions by using FBOs as development agents than as private businesses can lead to non-satisfaction of member's needs.

This situation has persisted and the government through its national policies for instance the Malawi Poverty Reduction Strategy (MPRS) of 2002 places importance on advancement of FBOs to facilitate smallholder farmer access to inputs, credit, output markets, market research, technical training and improve coordination within the smallholder sector (GoM, 2007). Over the years, literature has pointed out the importance of FBOs as a new approach to economic and social regulation that can advance access to services by smallholders farmers through replacement of governments' hierarchical coordination (Peacock *et al*., 2004). Moreover, FBOs have the possibility of improving the competitiveness of smallholder farmers in Malawi (Christian AID and CISANET, 2015).

In Malawi, pigeon peas (*Cajanus cajan*) is one of the major legume cash and food crops grown in the Southern part of the country. The production of pigeon peas has been increasing with an estimated annual production of 80,000 metric tons making the country the largest producer in East and Southern Africa (Christian AID and CISANET, 2015). The crop has several unique characteristics that makes it a very vital crop among the smallholder farmers. Nutritionally, it has important nutrients (protein and amino acids) that improve the diet of most households in the communities. Besides, pigeon peas is processed into dhal (split decorticated pigeon pea) and exported through the local, regional and international markets (Kananji *et al.*, 2009). The study also indicated that only 10% of processed pigeon pea is consumed locally, with the major focus being the export market.

The majority of smallholder farmers in Malawi mainly sell pigeon peas to local traders, who then sell to intermediaries and processing companies. This has led to availability of unorganised system of marketing that does not allow smallholder farmers to sell pigeon peas at a reasonable price. Therefore, the majority of such smallholder farmers depend mainly on rural buying agents who buy at low prices (Kulkarni, 2013). As such it has been found essential to bring together farmers into FBOs (associations and cooperatives) to enable smallholder farmers supply national and international markets successfully.

1.2 Statement of the Problem

Farmer-Based Organisations have been in existence in Malawi since 1978. These organisations are formed to provide agribusiness development services to smallholder farmers. These services include: access to output market, access to credit, access to extension, capacity building, access to market information and access to inputs. As much as this is the case, access to agribusiness development services by smallholder pigeon pea farmers remains a challenge. As a result, interventions meant to enhance the livelihoods of rural smallholder farmers become unsustainable and these farmers' business enterprises remain uncompetitive. Therefore, this study was aimed at determining the effect of farmer participation on profitability of pigeon pea enterprise in Mulanje District, Malawi.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of the study was to contribute towards improved smallholder livelihood through promotion of sustainable and market oriented FBOs among smallholder farmers in Malawi.

1.3.2 Specific Objectives

1. To compare the socio-economic characteristics of members and non-members of FBOs in Mulanje District, Malawi.
2. To determine the perception of pigeon pea farmers on the services provided by FBOs in Mulanje District, Malawi.
3. To determine the effect of farmer participation in FBOs on the gross margin of pigeon pea enterprise in Mulanje District, Malawi.

1.4 Research Questions

1. What are the socio-economic characteristics of members and non-members of FBOs in Mulanje District, Malawi?
2. What is the perception of pigeon pea farmers towards the services provided by FBOs in Mulanje district, Malawi?
3. What is the effect of farmer participation in FBOs on the gross margin of pigeon pea enterprise in Mulanje district, Malawi?

1.5 Justification of the Study

The National Export Strategy (NES) of 2016 for Malawi states that the increasing demand for pigeon peas in the world market and the need for increased public-private partnerships as a way of promoting market integration requires increased participation of smallholder farmers through FBOs (GoM, 2013). The National Agriculture Policy of 2016 also stipulates that there is need to double the production of legumes and promote value addition to achieve sustainable agricultural transformation that will result in significant growth of the agricultural sector, increase in farm incomes, improvement in food and nutritional security for Malawians and increase in agricultural exports (GoM, 2016). In this regards, given the fact that poverty reduction is a critical issue in Malawi with agriculture as the driving force to the same, higher farm returns from farm enterprises ensures income availability at farm household level. Hence, any study that aims to better understand functionality of FBOs geared to solve the problem of low household income is essential.

In this regard, this study will help to improve the production and marketing skills of farmers through selection of better integration channels for pigeon pea enterprise that will enable the farmers easily access production, marketing, advisory and financial services deemed to be necessary for the success of their enterprise. In addition, agricultural stakeholders, planners, NGOs and policy makers would have appropriate information when formulating policies, technologies, trainings and agribusiness extension methodologies that ensures full knowledge of agriculture development through FBOs. Future researchers who might be interested in a related topic would be able to have relevant literature about the study problem.

1.6 Scope and Limitations of the Study

This study focused on data for the 2015-2016 agricultural season and the area of coverage included Milonde, Msikawanjala and Thuchila Extension Planning Areas in Mulanje District, Malawi. This study was restricted to farmers whose major enterprise was pigeon peas. This study relied on the availability and accessibility of the members, hence respondents were followed to their homestead and farms for data collection. The study sorely relied on the farmer's ability to recall information due to poorly kept records. However, probing technique was used to enhance the accuracy of the information obtained

1.7 Operational Definition of Terms

Agribusiness: This is the commercialisation of pigeon pea production among smallholder farmers

Effect: This is a change that is observed on pigeon pea farmers brought about by the presence of a Farmer-Based Organisation

Farm Business Enterprise: It includes all activities (production, sales and purchases) of farm goods and services involving financial and commercial aspects.

Farmers Organisations: These are groups of farmers with special interests and concerns with developed structure, formal membership, status and a set of by-laws and rules to provide market opportunities and empowerment to all members.

Gross Margin: This is the difference between the gross income of pigeon peas and total variable costs incurred in production and marketing of pigeon peas. It is measured as gross margin per hectare.

Livelihood: This refers to the means of making a living and it includes the abilities of the farmer, assets, income and activities necessary to get the needs of life.

Market Access: This is the ability of smallholder farmers to participate in beneficial selling and buying of agricultural outputs and inputs.

Perception: This is the judgment that one can develop or have resulting from awareness or understanding of a particular issue or thing.

Value Addition: It includes local processing, packaging, or marketing, which improves the value of pigeon peas produced by smallholder farmers.

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CHAPTER TWO

LITERATURE REVIEW

2.1 Contribution of Farmer-Based Organisations to Agricultural Development

According to the Agriculture for Development Strategy (World Bank, 2008), the smallholder farm sector is recognized as the basis for attaining the growth of rural economies. Nonetheless, smallholder agriculture is time and again subjected to inefficient allocation of goods and services and other forms of market failures. Smallholder agricultural producers are usually not capable to benefit from economies of scale and have lower market access and bargaining power, particularly in rural areas. Therefore, farmers in such areas face higher transaction costs in most of non-labour transactions, such as the purchasing of inputs, capital access, or the selling of output. The need to counter these market hurdles and related government failures has led to the rise of many grassroots farmer-controlled organizations in developing countries in the recent past (Poulton *et al.*, 2010).

Farmer-Based Organisations (FBOs) emerged in the world to meet the needs of farmers such as sharing of local resources (water, labour and land) and market pressures (prices and access to markets). Other needs of farmers are also access to services (credit, input supply and advisory services) or purely social reasons (social security and food security) (Wennink *et al.*, 2007). A study by Chilongo (2005) indicated that cooperatives were the main FBOs in Sub-Saharan Africa (SSA) before liberalisation which were created and managed by the government. State control of these cooperatives led to poor accountability and dependence of cooperatives on state subsidies hence such cooperatives were uneconomically viable.

In this regard, the economic and institutional context of agriculture and other rural activities has undergone intense changes. Such changes include withdrawal of agricultural support by governments, privatisation and market liberalisation. These institutional reforms have led to development of new forms of business models (FAO, 2008). These include FBOs, contract farming and intermediary models by intermediary organisation or specialized providers aimed at balancing the needs of smallholder farmers and FBOs with that of emerging modern markets in terms of quality and volume. Such models assist in influencing decision making at local, national and international levels to foster agricultural and rural policies that mainstream importance of

smallholder farming in poverty alleviation. Following this, most smallholder farmers have had to make changes in their production processes (Swinnem *et al.*, 2010).

Farmer-Based Organisations (FBOs) are groups of farmers with special interests and concerns with developed structure, formal membership, status and a set of by-laws and rules to provide market opportunities and empowerment to all members. They are grouped into community-based and market-orientated organisations. Community-based organisations are village level cooperatives or associations dealing with inputs and output markets required by members to enhance their agribusiness enterprise efficiency. On the other hand, market orientated organisations focus on a single value added agricultural product which has an extended market. These FBOs incorporate research, supply of inputs, extension services, credit facilities, assembling, processing and marketing to get more returns on the investments by the members in the FO (Shingi and Chamala, 2008).

These Community-based and market oriented FBOs are involved in either backward production linkages or forward linkages. Backward production linkages focus on processing of agricultural products while forward production linkages focus on production of agricultural inputs (Haggblade *et al.,* 2007). Consequently, FBOs assist in improving access to agribusiness development services by its members. These include market information, capacity building, access to new technologies, organisation of input and output markets and access to credit. The bargaining power of rural smallholder farmers also becomes enhanced against other economic stakeholders like suppliers, processors and private traders.

In the advent of the Agenda 2030, agribusiness development through FBOs is considered important for economic growth subject to favourable policies, continued public-private investment, and robust partnership between the public and the private sector to improve access to resources by smallholder farmers. Likewise, donors and NGOs currently prefer dealing with FBOs in providing support to farmers where institutional failures exist (World Bank, 2016).

2.2 Farmer-Based Organisations in Malawi

The Malawian Cooperative Societies Act of 2012 and Cooperative Society Regulation of 2002 and the Trustees of Incorporation Act of 2000 were passed to promote rural development through formation of FBOs (cooperatives and associations). Recognising the importance of such Acts,

the Agricultural Extension Policy of 2000 policy calls for the involvement and participation of farmers in decision making through FBOs as platforms for coordination (Masangano and Mthinda, 2012).

In Malawi, smallholder farmers are mostly located in rural areas where access to land, physical and institutional infrastructure is poor. These farmers are faced with poor human capital due to illiteracy hence accessing useful knowledge on improved agricultural technologies from formal institutions becomes a challenge. Moreover, the majority lack financial and marketing skills and this necessitates high cost of transaction and low productivity due to limited mobility of inputs, produce and access to information. Farmers are then forced to sell produce in local markets at less competitive prices. Furthermore, it becomes difficult for smallholder farmers to enter high-value markets in light of the low quantity and quality of products, inconsistency in production and less bargaining power (CISANET, 2015).

Development of FBOs has therefore been found to be an effective intervention through which growth in smallholder farming can be enhanced. Common FBOs in Malawi include cooperatives, associations and clubs (FUM, 2012). Cooperatives are a form of business that is owned and democratically governed by its members while associations and clubs are mostly managed without a chain of command. These FBOs mainly focus on agricultural production, marketing and community savings and investment. Each of these FBOs focus on either one or more farm enterprise (crops or livestock).

The National Smallholder Farmers Association of Malawi (NASFAM) is a major FO in Malawi which is owned by smallholders. It was formed in 1995 to advance the livelihood of smallholder farmers through viable linkages of smallholder-owned business organisations. It promotes agribusiness aimed at developing the business skills of its members and provides interventions to improve the efficiency of the members. NASFAM has a membership of 100, 000 smallholder farmers who are organised into 43 associations countrywide. The services provided by NASFAM are divided into two namely; commercial and development services respectively. Commercial services include input and output market access and value addition. On the other hand, development services mainly focus on capacity building of the members (NASFAM, 2013).

The Farmers Union of Malawi (FUM) acts as the umbrella body of farmers and FBOs in Malawi. The union was instituted in 2003 to enhance creation of a conducive policy environment for farmers. Strategically, FUM centres on; improving the agricultural policy and controlling the working environment for market-led development and improved incomes among smallholder farmers; improvement of institutional and managerial capacity of FBOs that are members; empowerment of women and implementation of climate change mitigation initiatives. The union has 256 FBOs and 650 medium and large scale farmers as members (FUM, 2012).

In a study by Magreta *et al*. (2010), it was found that improvement of farmers capacity in FBOs is key for sustainability of such market linkages as it leads to improvement of gross margins for smallholder farmers' business enterprises hence improved income. In addition, improvement of farmers' lobbying techniques and use of participatory approaches to effectively utilise market opportunities rather than prescribing markets and products is critical for creating ownership of FBOs and empowerment of farmers. However, increased incomes among members depends on consistency in price stabilization policies, strength of FBOs and access to post-harvest management facilities. Thus, establishment of strong FBOs in the smallholder farming systems provides a mechanism for which smallholder farmers collectively stock their products and sell when the prices are better. Farmers can also obtain a commodity warranty to buy enough farm inputs to increase production levels. As such, enforcement of member subscription enables articulation and delivery of benefits to members through lobbying efforts which are often costly.

However**,** Mapila *et al*. (2010) indicates that although FBOs help in enhancing farm business enterprises, development of most FBOs becomes retarded and fail to accomplish the desires of its underprivileged members due to organisational challenges that emanate from formation of FBOs that are not owner oriented (demand driven) and presence of elitism. Elite members have human capital or leadership positions and usually are charismatic leaders having popular appeal and understand national policies and local government attitudes. This affects long term sustainability of governance and representation aspects as elites intensify marginalization of the poor through exclusion in decision making. Conversely, participation of elites in FBOs creates an attraction for late adopters of interventions, hence, they are a significant entry point for the provision of agribusiness development services. This is because such elites act as role models for

other smallholder farmers and this aids in strengthening affiliation and involvement of members and also increases technology adoption in FBOs.

2.2.1 Production and Marketing of Pigeon Peas in Malawi

Pigeon pea is grown in almost all types of free draining soils either in pure stand or in mixed cultivation with other crops such as maize and cassava. Nutritionally, it is a valuable source of vegetable protein and farmers grow it either for food or cash. In addition, it improves soil fertility through leaf litter and nitrogen fixation. It can be grown either as an annual or sometimes as a perennial crop. The present average yields range from 400 to 800 kg per hectare. However, the potential yield goes up to 2,500 kg per hectare from a pure stand (GoM, 2012).

According to Kamngoya (2015), Malawi is the second best source of pigeon peas for export to India. The country exported pigeon peas to India amounting to US$673,091,760. Myanmar exported pigeon peas valued at US$271,918,080 followed by Tanzania with US$164,211,208 and Mozambique with US$120, 551,367 as of 2015. However, the study indicated that Malawi is losing a lot on pigeon pea exports due to uncharted trade routes and limited production. This is because 40% of the pigeon peas from the overall production is exported informally through other countries. Worldwide production figures indicate that Malawi is ranked number three.

Malawi's Agricultural Sector Wide Approach (ASWAp) defines pulses (pigeon peas and beans) as crops for diversification. These crop products are considered to increase food security and can also be exported when the harvest is good. Pulses are grown by about 68% of smallholder farmers in Malawi. However, only 37 % is marketed. In this regard, promotion of pulses can help to build on the existing large number of growers hence benefit the population (ITC, 2012). Although the main growers of pulses are smallholder farmers, most the activities such as processing, packaging and exporting are highly dominated by larger firms which include: Export Trading Group (ETG), Transglobe Produce Export, Rab Processors and Commodity Processors Limited.

The Malawi National Agriculture Policy of 2016 also recognises that the agricultural marketing systems in Malawi has suffered from several challenges, including deficient or missing infrastructure, policy and regulatory incoherence, and low private and public investments. These constraints have rendered Malawian agricultural value chains uncompetitive, nationally and

regionally. Hence, the policy is aiming at facilitating the creation of new structured markets for legumes (GoM, 2016a)

In this regard, Kamiyala (2016) reported that selling as a group is more profitable since farmers can take pigeon peas to food processors and other exporters since big companies buys in larger quantities which individual farmers cannot manage to produce. The report also indicated that farmers are likely to realise less income from pigeon pea enterprise as vendors (local traders) rip them off by dictating the price and that some vendors buy lower than government-set minimum price. A report by Phiri (2015) indicated that contract farming should be promoted through formation of associations and cooperatives to enable farmers get better prices.

Contract farming is also seen as a way of enabling farmers to have a guarantee market access for their output at profitable prices, thereby benefiting from reduced market risk and uncertainty. Moreover, contract farming can benefit farmers through the provision of quality inputs and services that facilitate efficient production (productivity) under a formalised management structure. Contract farming also creates opportunities for agricultural processors and traders to guarantee adequate supply of agricultural output of high quality at an agreed price or price formula and at the desired time periods. It also enables the agricultural processors and traders to exercise control over production practices and set standards desired by the market, such as Good Agricultural Practices (GAP) and traceability, without investing themselves substantially in the production process (GoM, 2016).

Although formation of FBOs and contract farming have been seen as alternatives for farmers in accessing several agribusiness services especially markets, farmers and exporters involved in the pigeon pea value chain in Malawi still face pressure following an import cap of 200, 000 tonnes of pigeon peas that the Indian government has placed to protect the local prices following a record production (Chalanda, 2017).

2.3 Approaches of Service Delivery to Members of Farmer-Based Organisations

Service delivery to smallholder farmers is done by donors, governments, private companies, banks and FBOs through either a development approach or commercial approach. A development approach aims at improving supply of services, reducing unemployment, reducing poverty, capacity building and improving access to information. On the other hand, commercial approach focusses on increasing the profitability and efficiency of the farm enterprise and marketing channels (FAO, 2007). These approaches differ in; mechanisms used for services delivery, area of intervention, institutional structures, nature and system of remuneration. The private sector service delivery is a dominant direct service provider of business services mostly in form of financial support because it delivers services set inconsistent business transactions. The profit motivation and business nature of the provider guarantees sustainability and growth potential.

In terms of service delivery mechanisms, service providers use performance-conditioned access to services where farmers receive certain financial services or technical assistance upon completion of business plan. Other farmers cannot access inputs if they do not use the skill that they are trained on and these are called bundled services. Other mechanisms include use of preferential market access used by buyers that buy products only from farmers who use certain inputs and followed certain trainings, reductions in service prices for improved performance, shared risks and benefits of service provider and farmer, use of vouchers for inputs or training and participation in FBOs as a precondition to gain access to services, for example Farmer field Schools, learning groups or cooperatives (Blackmore *et al*., 2015).

There are a number of factors to consider for effective delivery of services to smallholder farmers. A service should be of high quality, have a perfect vision around what is required at the farm level to achieve farm quality in a comprehensive and consistent way, and be accessible. Farmers should be at the centre of considerations of design, implementation and evaluation. Over time, service delivery should exclude farmers who are not willing to give up worst practices and should be cost-efficient and affordable so that services can be financed directly from within the sector as a whole (Addai *et al.*, 2014).

However, transforming subsidized agribusiness service delivery by public and private sectors into commercially profitable agribusiness services requires a shift in attitude of farmers

otherwise sustainability problems arise. Likewise, joint collaboration among service providers promotes effectiveness and efficiency, reduces production and operating costs, and improves market value of products (FAO, 2007). Qiao *et al*. (2010) also indicated that there exists major dissimilarities in value added efficiencies of products and shares of benefits farmers obtain from FBOs of different structures. For traditional cooperatives, farmers can freely join or leave have open participation, capital is mostly made from patronage, illiquid possession rights, remaining claims between active and inactive members and a one member one vote norm. New generation cooperatives have closed affiliation and a provision condition subject to a risk of approving if members do not accomplish their responsibility.

In addition, traditional cooperatives are related to unifying farmers to produce and market in a moderately loose way, but, a new generation cooperative organizes farmers in a much tighter way, such as contract buying. The open membership in traditional cooperatives leads to a free-rider problem which causes short-term investment and underinvestment. On the other hand, new generation cooperatives boosts the incentives for members to invest, which possibly brings about greater product quality and greater product prices. However, lack of managerial and technical capacity, unclear membership, definition low levels of accountability and fragile financial bases detract significantly the ability of FBOs to become business oriented for long term sustainability (Ragasa and Golan, 2014).

2.4 Driving Factors for Collective Action through FBOs among Smallholder Farmers

FBOs are involved in a wide range of collective activities. Common activities include production, processing, marketing, input procurement and community development. However, most of the FBOs are formed with the hope of receiving free goods and services from development programmes, especially among groups engaged in collective production. Those engaged in processing and marketing are formed based on a market identified for their products, thus the commercial benefits for collective marketing or processing are clear from the beginning (Salifu *et al.,* 2012).

According to Fafchamps and Hill (2005) and Hill (2010), most members of FBOs frequently choose to engage in markets with local traders individually instead of acting collectively. This is due to substantial delays in payments to members due to delayed sales procedures taken by

FBOs and lack of access to reliable market information about the final sales prices that FO leaders negotiate when selling the members' harvest.

From a farmer's perspective, the incentive for FBO formation is to access social and economic benefits that are greater than what may be achieved without collective action. Thus a FO is effective when it generates net improvements in the individual livelihoods of the group members in social and economic capacities (Salifu *et al.*, 2010). Ojiagu *et al.* (2015) also indicated that the main reason for farmers to form and take part in FBOs is to enhance profitability of their enterprises. Improving farm profitability requires both on-farm actions and external measures delivered through the FBOs. It is essential for other stakeholders in product value chains to take responsibility for delivering measures that strengthen long-term income sustainability and competiveness of farming.

A study by Matchaya (2010) indicated that one of the significant factors affecting an individual's decision to join an association was the land area possessed by the household, which served as a proxy for household wealth. However, studies by Bernard *et al.* (2008) and Bernard and Spielman (2009) showed that poor farmers are sometimes left out of collective action arrangements because of their inability to meet the cost or pay the membership fee. On the other hand, there is little or no motivation for prosperous farmers to join groups because either the scale of their farm enterprise is sufficiently large to be profitable on its own or they feel reluctant to cooperate with other farmers who are less endowed (Bratton, 1986).

According to Bachke (2009), farm enterprise income is dependent on farm and farmer attributes such as age, marital status, membership to a FBO, education, cooperative marketing, credit, access to extension services, gender, business expertise, output, cost of farm input and implements, transport costs and price of output. The study indicated that participation of smallholder farmers in FBOs leads to an increase in profits. This means that FBOs emphasise on production of crops or livestock appropriate for the market rather than for consumption. Thus, FBOs can considerably contribute towards higher income and thereby wellbeing of smallholder farmers. In addition, Chirwa (2009) stated that selling in bulk at farm level is more profitable to farmers hence increase in profit margins can be achieved through collective marketing at farm level and through marketing associations. This motivates members to continue working towards the achievement of the FBOs objectives in the short and long run.

A study by Sokchea and Culas (2015) found that contract farming with FBOs increases the income of smallholder farmers. Generally, contract farming assures the marketing of produce and helps farmers to get high returns by increasing product quality and quantity. It also includes smallholder participation and access to contract farming opportunities where smallholder farming is not attractive to contracting firms. The pooling of productive assets of all farmers is advantageous for contract farming. However, the effect of FBOs on profitability of members' farm enterprises depends on how well they operate, how the contract negotiations are done between the farmers and the other market participants or actors to the contract.

2.5 Common Approaches of Profitability Analysis

There are a number of analytical tools used to determine the profitability of a farm enterprise as well as ascertain the factors that influence profitability. Some of the methods consist of gross margin analysis, value of production and total revenue. However, gross margin analysis happens to be the common method that is used to determine profitability. A study by Ahmad (2004) used partial budgeting model to determine the factors affecting profitability of carrot production in which gross margin was used to determine the costs of various inputs and the profitability of carrot cultivation. Gross margin was used because it is precise in estimating profit.

Erbaugh *et al.* (2009) focused on the profitability of sorghum farming in Tanzania and used gross margin analysis to determine the profitability. In this study, gross margin was calculated as the difference between total revenue and total variable cost. In addition, regression analysis was used to determine the factors that influence gross margin. In another study by Bagamba *et al.* (1998), gross margin analysis was used to determine the profitability of banana production in Uganda. Therefore, from the above literature, the most precise and common technique of estimating profits is gross margin analysis.

2.6 Theoretical Framework

2.6.1 Social Capital and Collective Action Theories

This study was based on social capital and collective action theories. Social capital is defined as the networks that enable collaborations among individuals. The fundamental idea behind social capital theory is that any structures of social organization, such as linkages, norms, and trust enables coordination and collaboration for shared benefits among members. Social capital in

organisations is accrued to maximise the interest of members and it promotes coordination, communication, incentivises future cooperation, and reduces opportunism by other market agents (Ostrom, 1994). Social capital can be in a structural dimension, relational dimension, cognitive dimension and external dimension. Structural dimension looks at social linkages or social connections a firm can use to get particular resources or aid a transaction. The relational dimension is the trust and trustworthiness implanted among members of a firm. Cognitive dimension refers to mutual vision that enables understanding collective orientation and means of acting in a group.

On the contrary, external social capital represents the inter-organizational linkages that a firm develops. FBOs involve a greater level of member participation in decision making and great intra-organisation costs. Social capital is thus an essential complement to formal institutions and governance in organisations characterized by collective action where trust and norms are prominently stressed (Liang *et al.*, 2015). Social capital is found at individual, informal social groups, formal organisations and community levels. Social capital is divided into four types namely; structural, cognitive, bonding bridging. Bonding is horizontal and equates to interaction between and among equals within an organisation. Bridging on the other hand is vertical or between organisation. Structural and cognitive social capital facilitates mutually beneficial collective action through shared norms, values, attitudes, and beliefs, established roles and social networks supplemented by rules and procedures.

The social capital theory is underpinned by collective action theory. This theory stipulates that most of the actions taken by groups of individuals are taken through organisations. The purpose is to achieve the interests of their members. Some organizations may fail to advance the interest of their members and others may be tempted into helping only the needs of the leaders. But, organisations often fail if they do not promote the welfare of their members (Olson, 1967). Furthermore, attraction of group membership is based on attainment of set goals by members in the group, such that there is no need in having an organisation when individual unorganised action can aid to achieve the interests of the individual. Therefore, organisations accomplish a function when there are collective group interests, even though organizations also help to achieve individual interests.

2.7 Conceptual Framework

In this study, motivation was a key factor for smallholder farmers to participate in Farmer-Based Organisations. These motivating factors that farmers producing pigeon peas could have included institutional factors like; access to inputs, access to output markets, access to extension, access to training, access to new agricultural technologies and access to credit. Furthermore, farmer characteristics namely age, gender, years of schooling, household size, off-farm income and marital status and farm characteristics such as farm size, yield of pigeon peas, distance to market and the amount of pigeon peas sold by the farmer also influenced the decision to join a FO. By making a decision to join a FO, the farmers (members) were expected to increase production and investment in pigeon peas enterprises due to improved access to essential production and marketing services. The end result was an increase in the gross margin for pigeon peas enterprise realised by the farmers. This was been conceptualized in Figure 1 below.

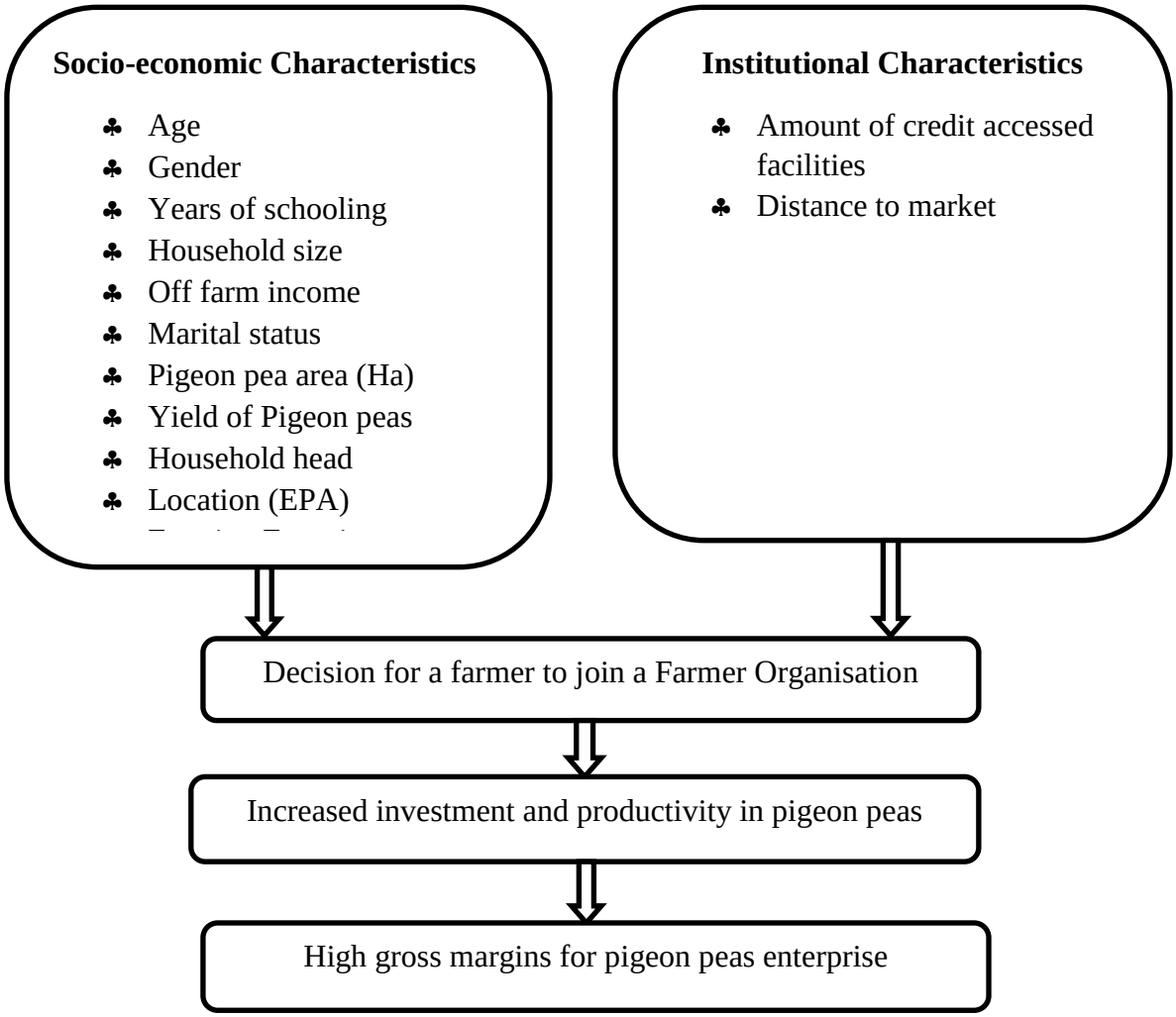

Figure 1: Effect of farmer participation in FOs on the gross margin of pigeon

CHAPTER THREE

METHODOLOGY

3.1 Study Area

This study was conducted in Mulanje district in the Southern part of Malawi. Mulanje District is situated 65 kilometres east of Blantyre and 293 kilometres east of Lilongwe and is located at the approximate latitude of 16°30´S and 35° 00´E. The total land area of the district is 2, 056 square kilometres with a total population of 428, 322. This gives a population density of 208 persons per square kilometre. The district lies at an altitude of 609 meters above sea level. The mean annual temperatures vary between 18 degrees Celsius to 30 degrees Celsius. Annual rainfall ranges from 1, 200 mm to 3, 500 mm (Mulanje District Council, 2002).

The district is divided into five Extension Planning Areas (EPAs) namely; Boma, Milonde, Kamwendo, Thuchila and Msikawanjala. However, the study was conducted in Milonde, Msikawanjala and Thuchila EPAs from which five Farmer-Based Organisations engaged in collective pigeon pea production and marketing were selected using purposive sampling method for the study. According to Mulanje DADO (2017), pigeon pea is one of the major cash crops in Milonde, Thuchila and Msikawanjala EPAs and that have identifiable and successful FBOs as compared to Boma and Kamwendo EPAs. In addition, the three EPAs have many public and private sector interventions to improve the production and marketing of pigeon peas among smallholder farmers with an aim of supplying markets successfully. In Mulanje district, there are 103 FBOs with a membership of 15, 818. However, the majority of the FBOs are in the targeted EPAs with 78 FBOs and a membership of 13, 956 out of which five FBOs with a membership of 1,771 promote pigeon pea as a major cash crop.

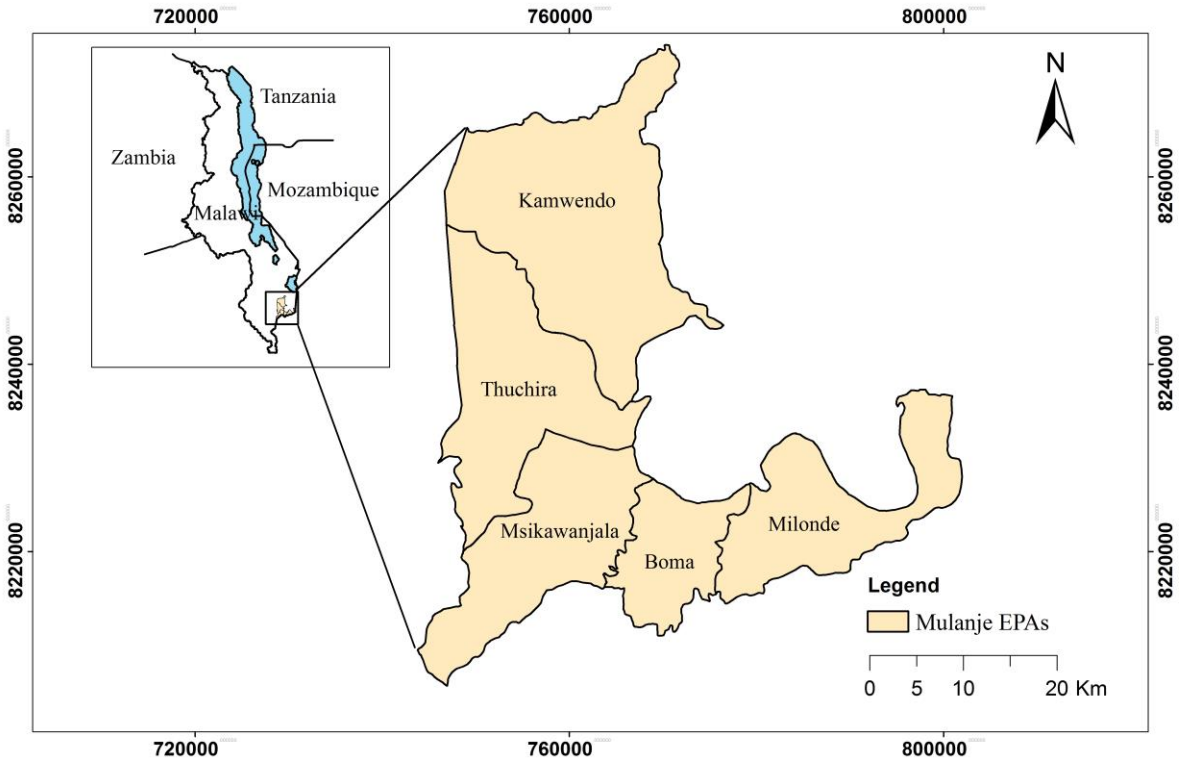

Figure 2: Map Showing Study Area (Source: Mulanje District Development Plan, 2007)

3.2 Research Design

In this study, cross-sectional survey research design was used to collect data from the respondents. Cross-sectional survey research design involved the collection of data at a single point in time (2015-2016 agricultural season) from the sampled farmers that were drawn from a well-defined population of pigeon pea farmers in Mulanje District, Malawi through the use of a semi-structured questionnaire. This design was used to determine the relationship between variables that were best describing the targeted farmers whose major enterprise was pigeon peas. Cross-sectional survey research design also offered the opportunity to assess differences between the sub-groups (members and non-members of FBOs) in the population that was targeted (Reis and Judd, 2014).

3.3 Sampling Design

3.3.1 Sampling Procedure

The target population for this study was that of smallholder farmers who were members and non-members of market oriented FBOs whose major enterprise was pigeon peas. In this study, five FBOs were selected using purposive sampling method from three EPAs (Milonde, Kamwendo and Thuchila) in Mulanje District. Secondly, systematic sampling method was used to select respondents from a list of members that was obtained from the targeted FBOs. On the other hand, for the counterfactual group of non-members, a list was generated through the use of extension officers and lead farmers under Mulanje District Agriculture Office. Systematic sampling method was then used to draw non-members from the list that was generated for each of the targeted EPA.

3.3.2 Sample Size Determination for Members of Farmer-Based Organisations

The formula by Yamane (1967) was used in this study to determine the appropriate sample size of respondents from the targeted FBOs. This formula is used when the target population is known which was also applicable to this study. The sample was calculated as follows;

$$n = \frac{N}{1 + N(e)^2} \quad \text{.....1}$$

Where; n represented the sample size, N represented the target population which was 123, 681 farming households and e was the desired level of confidence 95% and ±5% level of precision. The computation resulted into a total sample of 400 respondents. In this study, for each member of a FO, one non-member was selected from the targeted EPAs hence, the targeted sample comprised of 200 respondents being members of FBOs and 200 respondents were non-members of FBOs. For members of FBOs, the sample was allocated proportionately to each targeted FBO based on total membership as indicated in Table 1. On the other hand, the number of farm households for each EPA was divided by the total farm households for the all of the targeted EPAs and then turned into a percentage. The percentage obtained was then multiplied with each EPA's farm households to determine sample for non-members of FBOs as indicated in Table 2.

$$n = \frac{123,681}{1 + 123,681(0.05)^2} \approx 400$$

Table 1: Sample of Members per Targeted Farmer-Based Organisations

FO Name	Total Membership	Proportion to Total Target Population (%)	Sample
Khajavo Producers and Marketing Cooperative Society Ltd	370	21	42
Nkumbiza Producers and Marketing Cooperative Society Ltd	292	17	33
Chilozo Producers and Marketing Cooperative Society Ltd	397	22	45
Namulenga Producers and Marketing Cooperative Society Ltd	355	20	40
Lichenya Producers and Marketing Cooperative Society Ltd	357	20	40
Total	**1,771**	**100**	**200**

Source: Mulanje DADO (2017)

Table 2: Allocation of Sample of Non-members of FBOs per EPA

Name of EPA	Farm Households	Proportion to Total Target Population (%)	Sample
Milonde	50,429	41	82
Msikawanjala	30,378	25	49
Thuchila	42,874	35	69
Total	**123,681**	**100**	**200**

Source: Mulanje District Agriculture Development Office (2017)

3.4 Data Collection

The study used both primary and secondary data. Primary data was collected through use of semi-structured questionnaires. The semi-structured questionnaire was pre-tested to ensure its validity. The data that was collected included farmer characteristics (age, gender, years of schooling, occupation, experience in pigeon pea enterprise, off-farm income, household size, household head and marital status) and farm characteristics (yield of pigeon peas in 2015-2016

season, amount of pigeon peas sold, variable costs of production and marketing of pigeon peas, selling price of pigeon peas, farm size, land that was allocated to pigeon peas, the distance to the market for pigeon peas). It also involved collection of data on the services that are obtained by members from the FBOs including access to inputs, access to credit, access to extension services, access to training services, access to market information, access to market and access to new agricultural technologies. On the other hand, secondary data was collected from written records belonging to farmers, registers of members of an FO, financial records of FBOs, policy documents (NAP, Contract Farming Strategy, NES, ASWAp II, MGDS II and MPRS) and Agricultural Production Estimates (APES) reports.

3.5 Data analysis

In this study, data from the field was cleaned, coded to ensure consistency, uniformity, and accuracy. The data was then entered and cleaned in Statistical Package for Social Scientists (SPSS) Version 22. The data was then transferred to STATA Version 14 software to generate descriptive and econometric results for the study.

3.5.1 Analytical Framework

3.5.1.1 Specific Objective One

To compare the socio-economic characteristics of members and non-members of FBOs, descriptive statistics (mean and percentages) and inferential statistics (χ^2 and t-test) were used. The key variables for socio-economic profiling between members and non-members were; age, gender, marital status, years of schooling occupation, off-farm income, experience in pigeon pea enterprise, household head, household size, yield of pigeon peas, amount of pigeon peas sold, variable costs, selling price of pigeon peas, gross margin, farm size, land that was allocated to pigeon peas, the distance to the market for pigeon peas, access to inputs, access to credit, access to extension services, access to training services, access to market information, access to market and access to new agricultural technologies

3.5.1.2 Specific objective Two

A five point Likert scale was used to measure perception of farmers regarding the effectiveness of FBOs in promoting pigeon peas enterprises. The Likert scale was as follows: 1=strongly agree, 2=agree, 3=neutral, 4=disagree to 5=strongly disagree. The data was analysed using descriptive statistics (mean and standard deviation) and inferential statistics (F-test).

3.5.1.3 Specific Objective Three

In this study, propensity score matching (PSM) method was used to achieve this objective. Past literature also employed PSM to evaluate the effect of adopting a technology (value addition) on incomes and gross margins (Piabuo *et al*, 2015; Wu *et al*, 2010). The most commonly used methods of impact evaluation are the differences in differences approach (DID), endogenous switching regression (ESR), propensity score matching and instrumental variables approach (IV) (Julian *et al.*, 2014). The DID has the advantage of removing any bias introduced through both observable and unobservable factors. However, it requires pre and post project panel data generated through well designed experimental approaches. The limitation of IV was finding an appropriate instrument, which was challenging since the data for the current study was only a one shot survey on the program while ESR allows for the presence of endogeneity.

PSM is a non-experimental method used to estimate the difference in outcomes between beneficiaries and non-beneficiaries that is attributable to a specific program. PSM reduces the selection bias that may exist in non-experimental data. Selection bias exists when participants have not been randomly allocated to a particular program, and those units that are eligible to participate are systematically different from those who are not. It is essential to draw a counterfactual scenario about the outcome in absence of the intervention for one to infer the impact of an intervention on individual outcome. The challenge lies in the formation of a proper comparison group amid a large group of non-participants (Caliendo and Kopeinig, 2005).

Rosenbaum and Rubin (1983) suggest matching on the probability of participation, given all observable treatment-independent covariates X. The propensity score of vector X can be defined as:

$$P(X) = \Pr(Z = 1 | X) \quad \text{.....2}$$

Where, Z represents the participation indicator equalling one if the group participates, and zero otherwise. Since propensity score is a balancing score, the probability of participation conditional on X was balanced such that the distribution of observables X was equal for participants and non-participants. The differences between both groups were therefore reduced to the only attribute of the assigned treatment and unbiased impact estimates were obtained. The

counterfactual group can be known if potential outcomes Y_1 (Y_0) of participants (non-participants) are independent of participation, conditional on observables X:

$$Y_0, Y_1, \perp Z \mid X, \forall X \quad \text{……………………………………………………………} 3$$

This conditional independence assumption shows that the selection is entirely based on the vector of observables X that determines the propensity score, thus it rules out perfect predictability. In addition, in order to guarantee randomised selection the common support condition needs to be applied:

$$0 < P(X) < 1 \quad \text{……………………………………………………………………………} 4$$

It ensures that with identical observable characteristics groups have a positive probability to belong both to the participation and to control group. The assumptions together ensure that participation is ignorable and imply that:

$$Y_0, Y_1, \perp Z \mid P(X) \quad \text{………………………………………………………………………} 5$$

If outcomes are independent of participation given X, then they also do not depend on participation given P(X). As a result, the multidimensional matching problem is left to a one-dimensional problem. The distribution of possible outcomes was balanced among participants and counterfactuals.

The Probit and logit are standard approaches for estimating models with limited dependent variables (Wu *et al*., 2010). Both yield similar results when estimating the probability of a group participating or not participating in value addition. The study adopted a probit model to estimate propensity scores. The probability of participation, given vector X containing all observable characteristics, can be defined as:

$$P(X) = \Pr(Z = 1 \mid X) = F(\beta_1 x_1 + ... + \beta_i x_i) = F(X\beta) = e^{X\beta} \quad \text{……………………………} 6$$

Where F (·) produces response probabilities between zero and one. After the set-up of the core assumptions and the prediction of the probability of participation, one parameter that measures the differences in outcome between participants and non-participants is introduced in the next

step. Generally, the difference in potential outcomes can be captured in the treatment effect for an individual *i*, expressed as follows:

$$TE_i = Y_{i1} - Y_{i0} \quad \ldots\ldots 7$$

Where *i*= 1… *N* and *N* represents the total population. One parameter of interest is the average treatment effect on the treated (ATT). Applying the merged assumption of strongly ignorable treatment assignment involving both the independence of the outcome variable from treatment conditional on observable covariates and the common support assumption as introduced above, the real ATT based on PSM, can be presented as:

$$ATT_{PSM} = E_{p(x)}\{E(Y_1|Z=1, P(X) - E(Y_0|Z=0, P(X))\} \quad \ldots\ldots 8$$

In thought of the non-randomised selection of groups in the project, it might be possible that other unobservable factors had affected the participation decision. Rosenbaum (2002) suggests solving the problem of unknown bias by a bounding approach. Thus, within the probit model to estimate propensity score (equation 5) the probability of participation F(·) needs to be completed by a vector U containing all unobservable variables and their effects on the probability of participation captured by γ:

$$P(X) = \Pr(Z=1|X) = F(X\beta + U\gamma) = e^{X\beta + U\gamma} \quad \ldots\ldots 9$$

Rearranging the likelihoods ratio of two groups (*m* and *n*) who are identical in observable characteristics, the resulting relative likelihoods of participation is given by question 13.

$$\left(\frac{P(X_m)}{1-P(X_m)} * \frac{1-P(X_n)}{P_{(X_n)}}\right) = \frac{e^{\beta_n x_n + \gamma_n u_n}}{e^{\beta_m x_m + \gamma_m u_m}} = e^{[\gamma(u_m - u_n]} \quad \ldots\ldots 10$$

As long as the *U* between the two groups is similar or if the unobserved variables got no effect on the probability of participation, the relative odds ratio becomes one and the selection procedure is random.

Matching algorithms

After calculation of propensity scores, there is need for an algorithm to match farmer groups who have engaged in value addition and those who have not. This is normally based on the closeness of their propensity scores (Wu *et al*., 2010). Heckman (1979) suggested matching algorithms

such as nearest neighbour (NN) matching, kernel matching, local linear (LL) matching, radius (caliper) matching and weighting. NN matching is the most straightforward matching estimator. Each individual from the control group is selected as a matching partner for a treated individual. The choice of individuals from a comparison group is based on closeness in terms of propensity scores. The NN matching faces a risk of bad matching if the closest neighbour is far away since its role is to match each farmer group from the participators with the farmer group from non-participants with the closest propensity score

Radius matching is used to reduce the NN matching risk, which imposes a maximum tolerance on the difference in propensity scores. Allowing for replacement in NN matching works in the same way as imposing a caliper (propensity score distance) in radius matching. This method helps to avoid bad matches hence increasing the quality of matching. For this matching method, apart from choosing individuals from a comparison group based on propensity scores, the selection is also done in terms of the caliper (propensity range). As noted by Smith and Todd (2005) a possible shortcoming with this method is the inability to have a foreknowledge on the choice of a tolerance level which is reasonable. In contrast to caliper matching an alternative to this technique called radius matching is suggested by Dehejia and Wahba (2002). Rather than just using the nearest neighbour in each caliper for comparison, radius matching uses all the comparison individuals within the caliper. The advantage with this method is that as many units as are available in the caliper are used for comparison hence allowing the usage of fewer units when good matches are not available and vice versa.

For stratification (interval) matching, the common support of the propensity score is divided into strata. The mean difference in outcomes between participants and non-participants is obtained through the calculated impact within each strata. The choice of the number of strata is dependent on the balance of propensity score within each stratum (Aakvik, 2001). The kernel and LL matching are non-parametric matching estimators that use a weighted average of all individuals in the control observations to come up with a counterfactual. Since more information is used a lower variance is achieved in turn. The highest weight is placed on those control units with scores closest to the treated thus assigns a weight which is inversely proportional to the distance between the propensity score and the corresponding treated unit. The merits associated with this method is that it produces average treatment effect estimates with lower variance due to use of

much information. However the method has its own weakness in that observations which are bad matches are possibly used (Caliendo and Kopeinig, 2005).

The current study used NN matching, stratification matching and radius matching to estimate the effect of value addition on income.

Table 3: Description of the variables used in the econometric analysis

Variable	Definition	Measurement
Dependent Variable		
Group membership	Membership in farmer group (1=yes; 0=no)	Dummy
Independent Variables		
Location (EPA)	Location of the Farmer (EPA)	Dummy
Age	Farmer's actual age (years)	Years
Gender	Respondent's gender (1=male; 0=female)	Dummy
Education	Actual years of schooling	Years
Household size	Number of household members	Persons
Household head	Head of household	Dummy
Pigeon peas area	Pigeon peas production area	Hectares (Ha)
Marital Status	Marital Status of Household	Dummy
Farming Experience	Years of business Farming	Years
Credit access	Amount of credit	MK
Off-farm income	Income from non-farm activities	MK
Pigeon pea yield	Yield of pigeon peas	Kg/ha
Distance to market	Distance to primary market	Km

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Sampled Households

The first section discusses the descriptive results that are comparing the socio-economic characteristics of members and non-members of Farmer-Based Organisations. The comparison was mainly focussing on gender, marital status, household head, occupation, age, years of schooling, off-farm income, household size, farming experience, distance to market, farm size and gross margin analysis.

4.1.1 Results on Gender, Marital status, Household head and Occupation

The study results in Table 4 indicate that 70 percent of the respondents were female and 30 percent were male. Among the members of the targeted FBOs, 68 percent were female and 32 percent were male. On the other hand, for the non-members, 72 percent were female and 28 percent were male among the non-members. Generally, participation of females in FBOs was found to be higher than that of males. This was because there was a requirement that 50 percent of the members were to be females, 25 percent males and 25 percent comprising of the youth. This was based on the advice from MoIT during registration that there was need to uplift female and the youth categorised as belonging to vulnerable groups. This is in line with the study by Buadi *et al*. (2013) which indicated that females become household heads in the absence of an adult males considered capable of being the household head.

In relation to the household head, results in Table 4 indicate that overall, 79 percent were male-headed households and 20.2 percent were female-headed households. Out of the sampled members of the targeted FBOs, 77 percent were male-headed households and 23 percent were female-headed households. Conversely, 82.5 percent were male-headed households and 17.5 percent were female-headed households among the non-members. The high percentage of female-headed households for members of FBOs was because more females regarded FBOs as Income Generating Groups (IGPs) as compared to non-members. According to Kaaria *et al*. (2016), enhancement of women's participation in FBOs can lead to improved governance and organizational performance, better management of natural resources and improved household well-being. However, social-cultural norms that associate men as being responsible for

productive and income generating activities than women that tend to be seen as responsible for childcare and still hinder the possibility of women to become members in their own right and access the services and benefits that FBOs can provide.

Regarding marital status, 1.8 percent of the targeted farmers were single, 79.3 percent were married, 6.3 were divorced and 12.8 percent were widowed. For members of FBOs, 1 percent were single, 78 percent were married, 8 percent were divorced and 13 percent were widowed. On the other hand, 2.5 percent were single, 80.5 percent were married, 4.5 percent divorced and 12.5 percent widowed among the non-members. A study by Martey *et al*. (2014) indicated that marriage increases the concerns by farmers on their welfare hence it leads to increased participation in agricultural technology adoption.

Overall, the results in Table 4 indicate that the majority (67 percent) had farming as the major source of livelihood while 30.5 percent of the farmers were involved in businesses. The remaining 1.8 percent and 0.8 percent had casual labour and formal employment as their main occupation. Among the members of FBOs, 25 percent were involved in other businesses, 72.5 percent mainly were mainly engaged in farming, 2 percent were engaged in casual labour and 0.5 were in formal employment. On the other hand, 36 percent of the non-members were involved in other businesses, 61.5 percent were engaged in farming, 1.5 percent were engaged in casual labour and 1 were in formal employment. Yamano *et al.* (2008) states that households that take farming to be the main occupation gain more experience on production and marketing, hence they are able to maximize production.

Table 4: Gender, marital status, household head and occupation of household head

Characteristic	Description	Member (%)	Non-member (%)	Pooled (%)	χ^2
Gender	Female	68	72	70	0.762
	Male	32	28	30	
Marital Status	Single	1	2.5	1.8	6.392
	Married	78	80.5	79.3	
	Divorced	8	4.5	6.3	
	Widowed	13	12.5	12.8	
Household head	Male headed	77	82.5	79.8	1.873
	Female headed	23	17.5	20.2	
Occupation	Business	25	36	30.5	6.249
	Farming	72.5	61.5	67	
	Casual Labour	2	1.5	1.8	
	Employment	0.5	1	0.8	

4.1.2 Results on Age, Schooling, Off-farm Income, Household Size and Farming Experience

The study results in Table 5 indicate that the overall average age of the sampled farmers was 41 years. However, the study found that the average age of members and non-members of FBOs was 44 and 38 years respectively. This showed that members of FBOs were older than non-members with a mean difference of 6 years. The mean difference of age between the members and non-members of the FBOs was significantly different at 1 percent level. Irrespective of the significant difference in age, the study results indicate that both members and non-members of FBOs were within the economically productive age group. A study by Kumwenda and Mingu (2005) found that the majority of FBOs in Malawi places much emphasis on those that are within the economically productive age group, normally between 25 to 55 years old.

In terms of education level of the respondent, the overall average years of schooling was found to be 6 years of schooling. For members of FBOs, the average years of schooling was 7 years while non-members had an average of 5 years of schooling. This shows that members of the FBOs are better educated than non-members. This is because some members were retired teachers and youth who mostly reached 8 years of schooling as compared to the non-members. The average age was significantly different at 1 percent level. Education, in this study meant the ability to read and write and it affects the farmer's level of vulnerability to the adoption of innovations and modern farming methods positively as it is human capital investment that improves income (Ojiagu *et al*., 2015).

Regarding off-farm income of the household, the results in Table 5 indicate that the average off-farm income for targeted farmers was MK230, 097 during the 2015-2016 agricultural period in Malawi. Regarding members of FBOs, the average off-farm income was MK220, 034 as opposed to non-members who had MK240, 160 as average off-farm income. Off-farm income activity is important in agriculture as it improves disposable income by providing additional income for attaining production inputs such as land and labour. It also improves access to information due to exposure of the household head. However, participation in off-farm income activities can also limit the time available for carrying out agricultural activities (Tikabo, 2003).

In terms of household size, the results in Table 5 indicate that the sampled farmers had an average of 6 members per household. However, the average household size for both members and non-members of the FBOs were found to be 6 and 5 respectively with a mean difference of 1. This clearly shows that the average household size for members of FBOs in the study area was higher than the national average of 5 members per household (GoM, 2012b). This was because it was considered by the farmers as a norm to have a large household size which could really help the family in carrying out farming activities. This is in line with a study by Martey *et al*. (2012) which indicated that large families enable household members to earn additional income from non-farm activities.

With regard to farming experience, the average faming experience in pigeon peas for the targeted farmers was 8 years. Members of the FBOs had 8 years of farming experience in pigeon pea enterprise while non-members had 9 years higher by 1 year to that of members. This shows that non-members have slightly higher experience in the enterprise as opposed to the members of the

FBOs focusing on pigeon peas as the major enterprise. A study by Obisesan (2014) found that experience in farming business helps farmers to evaluate the merits and demerits of agricultural technologies before using them.

Table 5: Results on age, household size, schooling, off-farm income and farming experience

Variable	Members (n=200)		Non- Members (n=200)		Pooled (n=400)		t-value
	Mean	SD	Mean	SD	Mean	SD	
Age (Years)	43.56	13.496	37.80	13.727	40.68	13.897	4.232***
Household Size	5.72	2.008	5.39	2.014	5.55	2.016	1.641
Years of schooling	6.50	3.646	5.34	3.545	5.91	3.639	3.225***
Off-farm income	220,034	196,006	240,160	226,310	230,097	211,021	-0.512
Experience (Years)	7.96	8.573	8.50	8.367	8.23	8.465	-0.637

Note: *** indicates significance level at 1%

4.1.3 Major Markets for Pigeon Peas in Mulanje District

In Malawi, linking smallholder farmers to markets is considered a critical part of any long term development strategy to reduce poverty and hunger. The study results in Table 6 show that 56.3 percent of the targeted farmers were found to be selling pigeon peas to local traders as the major output market. Nine (9) percent of pigeon pea farmers sold pigeon peas to Auction Holdings Commodity Exchange (AHCX) and Agricultural Commodity Exchange (ACE) who are operating a Warehouse Receipt System (WRS). With regard to members, 18 percent sold pigeon peas to AHCX and ACE, 15 percent to private companies and 22 percent to local traders (vendors). Conversely, 1 percent of the non-members were sold pigeon peas to Non-governmental organisations (NGOs) through seed multiplication agreements and 90.5 percent were mainly selling pigeon peas to local traders. The results show a significant difference at 1 percent in the market choices of pigeon pea farmers. From the study results, farmers who are members of FBOs are able to get specific advisory, financial and material support from different organisations or stakeholders than non-members. A study by Gyau *et al.* (2014) indicated that improving market access for smallholders can lead to improved income and food security through collective action that address market failures that often limit farmers' ability to be linked to markets by reducing the risks of market participation. In addition, Escobal *et al.* (2015) states that direct linkages between the producers and processors are increasingly being seen as a viable strategy for linking farmers with food chains. Besides, the sale contracts, farmers receive embedded services from the contracting company.

Table 6: Output markets for pigeon peas

Market	**Member (%)**	**Non-Member (%)**	**Pooled (%)**	χ^2
Auction Market	18	0	9	196.262***
NGO	7	1	4	
Private Companies	15	0	7.5	
Local Traders	22	90.5	56.3	
FO	1	0	0.5	
NASFAM	0.5	0	0.3	
None	37	8.5	22.5	
Total	**100**	**100**	**100**	

Note: *** indicates significance level at 1%

4.1.4 Results on Distance to the Market, Farm Size and Land Allocated to Pigeon Peas

Regarding distance to the market, the study results in Table 7 indicate that farmers travelled an average distance of 50.32 kilometres (Km) to the market. On average members of FBOs travelled 65.13Km to the market while non-members of FBOs travel of 12.84 Km to the identified market. Members of FBOs travel a long distance because the Auction Market, NGOs and private companies being some of the markets for pigeon peas are mostly further away from where farmers live as compared to local traders who mostly are found where farmers live as indicated in Table 6 above. In this regard, the findings showed that there was a significance difference in the mean distance covered by members and non-members of FBOs respectively at 1 percent significance level. Ellis (2007) and Martey *et al*. (2012) found that distance to the market had a significant and negative impact on the level of market orientation among the firms. In addition, the studies indicated that distance to market puts a transaction cost to households and defines the size of produce to be sold.

In terms of farm size, the results in Table 7 indicate that the sampled farmers had an average of 1.03 hectares (ha). For the sampled members of FBOs, the average landholding size was 1.11 ha. On the other hand, non-members had an average farm size of 0.95 ha. This shows that members have a slightly bigger farm size than non-members with a mean difference of 0.16 ha. However, these the farm size is lower than the national average farm size of 1.4 ha (GoM, 2012b) and higher than the district average farm size of 0.4 ha (GoM, 2005). Regarding allocation of land to pigeon pea production, overall, farmers allocated an average of 0.75 ha to production of pigeon peas in 2015-2016. On average, members of FBOs allocate slightly less land to pigeon peas production as compared to non-members of FBOs with a mean land size of 0.73 ha and 0.78 ha respectively. According to Martey *et al*. (2012), larger farm size serves as an incentive to produce more for the market.

Table 7: Results on market distance farm size and land allocation to pigeon pea production

Characteristic	Members (n=200)		Non-Members (n=200)		Pooled (n=200)		t-value
	Mean	SD	Mean	SD	Mean	SD	
Distance to Market (Km)	65.13	21.72	12.84	5.314	50.32	30.078	13.422***
Farm Size (ha)	1.11	1.045	0.95	1.045	1.03	1.047	1.562
Land allocated to Pigeon Peas (ha)	0.73	0.855	0.78	0.943	0.75	0.899	-0.585

Note: *** indicates significance level at 1%

4.1.5 Gross Margin Analysis of Pigeon Pea Enterprise

For the 2015-2016 production season as indicated in Table 8, the average yield of pigeon peas for a farmer was 248.13 Kgs per ha. The members of FBOs that were sampled had a mean yield of 302.89 Kgs per ha of pigeon peas as opposed to non-members who had produced 193.37 Kgs per ha of pigeon peas with a mean difference of 109.52 Kgs per ha. This may also be the reason why members sell more pigeon peas with a mean amount of 229.95 Kgs as compared to non-members with a mean amount of 159.97 Kgs of pigeon peas sold. Both amount of pigeon peas produced per ha and sold by members and non-members of FBOs was significantly different at 1 percent level. Mensah *et al*. (2012) stated that cooperatives are able to gather the volume of produce of their members and handle output marketing by finding market outlets and negotiate quantities and prices with their selling partners.

On average, the gross income obtained from the pigeon pea enterprise by the farmers was MK79, 723.75 per ha. For members of the FBOs, gross income was MK100, 506.75 per ha while non-members had a gross income of MK58, 940.75 per ha. Gross income was significantly different at 1 percent level. The results in Table 8 indicate that members of FBOs had a higher gross income from the pigeon pea enterprise as compared to non-members. This is attributed to the high yield of pigeon peas realised by members of the FBOs.

Results in Table 8 indicate that farmers spent MK7, 967.64 per ha on seed. On average, members of FBOs spent MK9, 577.53 per ha while non-members spent MK6.357.75 per on seed. The cost of buying seed was significantly different at 1 percent level. In this regard, members FBOs incurred more costs on seed because of using improved varieties of pigeon pea seed that are usually bought at higher prices. On the other hand, most non-members use recycled seed (harvest from previous season) hence the low cost in seed. On packaging materials (sacks), farmers spent an average of MK880.84. Members of FBOs spent an average of MK1, 106.75 on packaging materials (sacks) while non-members spent an average of MK654.93. The cost of packaging materials is significantly different at 1 percent level. Members of FBOs spent more money on sacks due to the high yield of pigeon peas obtained.

On transport, farmers spent an average of MK1, 540.58 when acquiring inputs, MK1, 962.63 when selling the pigeon pea and MK2, 946.10 when transporting pigeon pea produce from the farm. On average, members of FBOs spent MK2, 170.65 on inputs, MK2, 667.75 when going to market and MK3, 725.95 on harvesting as transport cost while non-members of FBOs spent MK910.50 on inputs, MK1, 257.50 as transport cost to market and MK2, 166.25 during harvesting. The cost of transport is significantly different at 1 percent level. Members of the FBOs spent more on transport as the source of inputs and market for the pigeon peas was mostly found Blantyre, which far from where the farmers stay. The high cost of transporting pigeon pea from the farm during harvesting is due to the high yield of pigeon peas obtained by the members of the FBOs as compared to the non-members.

Results in Table 8 indicate that the average casual labour cost for planting for all the targeted farmers was MK3, 079.63 per ha. The average labour cost for planting incurred by members of the FBOs was MK3, 407.75 as opposed to non-members who on average had incurred MK2, 751.50. The cost of casual labour on planting was significantly different at 10 percent level. This showed that members of FBOs incurred higher labour costs on planting than non-members. This is contrary to a study by Awotide *et al.* (2015) which found that non-members of cooperative organisations spend more on fertilizer, herbicide, ploughing, planting and bagging as compared to the members.

On average, farmers producing pigeon peas spent MK578.88 on winnowing and MK543.38 on breaking the pigeon pea pods. For members of the FBOs the cost of winnowing and breaking the pods was MK268.75 and MK264.00 while non-members spent MK889.00 on winnowing and MK822.75 on breaking pods. The cost of winnowing and breaking the pods was significantly different at 1 percent. In this regard, members of FBOs incurred less cost on winnowing and breaking the pods as cooperatives to which they were affiliated to have machines which were being used for such processes as compared to non-members who mostly used casual labour for such processes.

The average gross margin (GM) was MK28, 611.39 per hectare for all the pigeon pea farmers. With regard to members, the GM was MK47, 093.12 per hectare as compared to that of non-members amounting to MK10, 129.65 per hectare respectively. As the study results show in Table 8, there was a significant difference in the GM of members and non-members at 1 percent level. This was because cooperative members achieved higher yields as compared to non-members. The higher yield for FO members was attributed to supporting services that the farmers accessed from the FO such as access to seed, access to extension services, access to training and technical backstopping relating to pigeon peas production and agribusiness. this is in line with a study by Kabuli (2013) which found that cooperative members had higher gross margins than non-members.

Table 8: Results on gross margin for pigeon pea enterprise

Characteristic	Members (n=200)	Non-Members (n=200)	Pooled (n=400)	t-value
Pigeon pea yield (Kgs/ha)	302.89	193.37	248.13	4.754***
Farm gate price (MK)	331.92	315.50	323.71	1.499
Gross Income (MK)	100,506.75	58940.75	79,723.75	5.427***
Variable Costs				
Seed (MK/ha)	9,577.53	6.357.75	7,967.64	2.755***
Pesticide (MK/ha)	2,713.83	1,962.33	2,338.07	1.509
Sacks (Packaging)-(MK)	1,106.75	654.93	880.84	4.093***
Transport-Inputs	2,170.65	910.50	1,540.58	2.992***
Transport-Selling pigeon peas	2,667.75	1,257.50	1,962.63	3.209***
Transport-harvesting	3,725.95	2,166.25	2,946.10	3.661***
Land preparation (MK/ha)	14,839.75	15,997.50	15,418.62	-0.844
Planting labour (MK/ha)	3,407.75	2,751.50	3,079.63	1.823*
Harvesting labour (MK/ha)	3416.50	3,471.00	3,443.75	-0.130
Weeding labour (MK/ha)	10,871.00	12,124.25	11,497.63	-1.080
Winnowing labour (MK)	268.75	889.00	578.88	-6.096***
Beating Pods labour (MK)	264.00	822.75	543.38	-6.776***
Pesticide application (MK/ha)	1,150.25	1,221.25	1,185.75	-0.317
Total variable costs (MK)	53,903.10	49,952.90	51,928	1.115
Gross Margin (MK/ha)	47,093.12	10,129.65	28,611.39	5.484***

Note: *** and * indicate significance level at 1% and 10% respectively

4.2 Access to Services by Pigeon Pea Farmers in Mulanje District

4.2.1 Reasons of Farmers for Joining and Not Joining Farmer Organizations

In Mulanje district, pigeon pea farmers joined and others did not join FBOs due to different reasons. For members of the targeted FBOs, the majority (41 percent) of the farmer joined to have increased bargaining power. In addition, 35.5 percent of the farmers joined to have access to extension services, market and market information while 11.5 percent joined to have access to inputs, credit and savings services provided by the FBOs.

Table 9: Reasons for joining a Farmer-Based Organisations

Reason for joining an FBO	Percentage (%)
Increased Bargaining Power	41
Access to Inputs, credit and Savings services	11.5
Access Extension Services, Market and Information Access	35.5
No Reason	12
Total	**100**

Conversely, results in Table 10 indicate that 35 percent of the non-members did not join due to lack of awareness on the availability of the FBOs. Besides, 22 percent of the non-members did not join FBOs because they had no time, money and interest while 5.5 percent of the non-members indicated that due to poor leadership and coordination, joining the FO was not an option. Lastly, 0.5 percent of the farmers indicated that low production of pigeon peas made it difficult for them to sell through the FO.

Table 10: Reasons for not joining a Farmer-Based Organisations

Reason for not joining an FO	Percentage (%)
Poor Leadership and coordination in FBOs	5.5
Not Aware of FO existence	35
Have no time, money and interest to join	22
Low Production of pigeon peas	0.5
No Reason	37
Total	**100**

4.2.2 Access to Market Information by Members and Non-members from FBOs

In Mulanje district, smallholder farmers access market information from different sources. In terms of sources of market information in Table 11, the study results indicate that 21.3 percent of the sampled farmers obtained market information from fellow or lead farmers and local traders 16.3 percent from MoAIWD, 18.5 percent from MoAIWD, radio, NGO, ACE and NASFAM, 1 percent from the FO and 8.5 percent from MoAIWD and fellow or lead farmers. However, Table 11 shows that 23 percent of the FO members were getting market information through the FO from MoAIWD, radio, NGO, ACE and NASFAM. Although non-members of FBOs had no access to market information through the FO, 23 percent of non-members rely on fellow or lead farmers and local traders as a source of market information. The market information was focused on price of pigeon peas, pigeon pea quality, and market availability and production technologies. The study results indicate that there was a significant difference in the source of market information at 1 percent level. According to Dentoni and Krussmann (2015), new private market entrants providing information technology services play a role in conveying information to farmers through text message systems. For example, Esoko Ltd that provides automatic and personalized price alerts, buy and sell offers, extension messages, and contact profiles via SMS. However, there are problems on the accuracy of information provided to farmers as at times farmers receive conflicting messages on input or output prices**.**

Table 11: Source of market information for members and non-members of FBOs

Source	**Member (%)**	**Non-members (%)**	**Pooled (%)**	χ^2
Fellow/Lead Farmers and Private Traders	20	23	21.3	47.935***
MoAIWD	12	20.5	16.3	
MoAIWD, Radio, NGO, ACE and NASFAM	23	14	18.5	
Farmer-Based Organisations	1.5	0	1	
MoAIWD and Fellow/Lead Farmers	16.5	0.5	8.5	
None	27	42	34.5	
Total	**100**	**100**	**100**	

Note: *** indicates significance level at 1%.

4.2.3 Access to production inputs by members and non-members from FBOs

In terms of sources of inputs (seed, pesticides and fertilizer), the study found that farmers had different sources as shown in Table 12. The study results indicate that 75.6 percent of the farmers purchased production inputs as individuals, 14.5 percent accessed inputs from or through the FBOs, 6.6 percent accessed inputs from the MoAIWD, 2.9 percent from NGOs and 0.8 percent accessed inputs through projects. In this regard, 53.5 percent of the members and 97.5 percent of the non-members of the targeted FBOs bought production inputs individually.

In addition, 29.5 percent and 11.5 percent of the members accessed production inputs from or through the FBOs and MoAIWD as compared to 0 percent of the non-members who did not access production inputs from such sources. NGOs also provided production inputs to 4 percent and 1.5 percent of members and non-members of the targeted FBOs respectively. Members of FBOs had many sources of production inputs because, NGOs, MoAIWD and development projects were implementing activities using a group approach for a greater impact as compared to individual approach. The results indicate a significant difference at 1 percent level in terms of the source of production inputs. The study findings are in line with Ojiagu *et al*., (2015) who found that participation of farmers in FBOs improves access to high quality production inputs.

Table 12: Source of production inputs for members and non-members of FBOs

Source of inputs	**Member (%)**	**Non-members (%)**	**Pooled (%)**	χ^2
NGO	4	1.5	2.9	276.177***
MoAIWD	11.5	1	6.6	
Farmer-Based Organisations	29.5	0	14.5	
Project	1.5	0	0.8	
Individual buying	53.5	97.5	75.6	
Total	**100**	**100**	**100**	

Note: *** indicates significance level at 1%.

4.2.4 Access to credit by members and non-members from FBOs

In relation to sources of credit, the results in Table 13 indicate that 1 percent of the members sourced their credit from banks especially microfinance institutions like FINCA, Opportunity International Bank of Malawi (OIBM) and Bridge Finance. In addition, 5 percent of the members also received credit from their FBO and government while 1.5 percent obtained credit from their fellow farmers. For non-members, the main source of credit was from government with a 2.6 percent. The study results also indicate that 2.3 percent obtained credit from village savings and credit groups (VSL) while 1 percent of the remaining non-members obtained credit from micro-finance institutions and fellow farmers. The interest rate for credit accessed by the farmers was ranging from 2 percent to 100 percent. Although FBOs could be used as a guarantor for members of the FBOs, the study results indicated that both members and non-members had less access to credit services. This was due to the fact that the targeted FBOs were deemed not to be financially sound to pay for defaulters. In addition, the targeted farmers did not have collateral to use to get a loan.

The results in Table 13 indicate that there was a significant difference in terms of sources of credit between members and non-members of the FBOs. Improved access to credit helps smallholder farmers to overcome financial problems existing between harvesting and land preparation. Nzomoi *et al.* (2007) and Benjamin *et al.* (2013) found that credit enables farmers to overcome their financial constraint and adopt innovations involving some cost thereby increasing the resources and asset base of the farmer which enables them to venture into lucrative but possibly distant markets. Most financial institutions do not lend to farmers because of the risky nature of farming, and even those who do, will demand for collateral which the farmers cannot afford individually.

Table 13: Source of credit for pigeon pea farmers

Source of credit	Member (%)	Non-members (%)	Pooled (%)	χ^2
Bank (FINCA, OIBM, Bridge Finance)	1	0.5	1.2	24.067***
Farmer-Based Organisations and Government	5	0	2.6	
Fellow Farmer	1.5	0.5	1	
VSL	0	4.5	2.3	
None	92.5	94.5	93.3	
Total	**100**	**100**	**100**	

Note: *** indicate significance level at 1%.

4.2.5 Access to Extension Services by Pigeon Pea Farmers from FBOs

Pigeon pea farmers in Mulanje district are able to access extension services from different sources that focus on production of pigeon peas, collective marketing, banking, value addition, group dynamics (leadership), cooperative member education, financial literacy (savings and investment) and gender, HIV and AIDS). The study results in Table 14 indicate that 22.5 percent of the pigeon pea farmers obtain extension services from MoAIWD and Ministry of Industry and Trade (MoIT), 13 percent obtain extension services from fellow or lead farmers, 12.9 percent from FBOs, radio and FUM and 9.1 percent from banks and NGOs. Among the targeted members of FBOs, 28.5 percent obtain extension services from MoAIWD and MoIT as a major source while 18.5 percent of the non-members of the FBOs accessed such services from fellow or lead farmers found in the EPA. Wossen *et al.* (2015) stated that access to extension enhances the adoption of improved agricultural technologies by educating farmers on best farming and management practices.

Table 14: Source of extension services for members and non-members of FBOs

Provider of Extension service	Member (%)	Non-members (%)	Pooled (%)	χ^2
Fellow or lead farmer	9.5	18.5	13	82.626***
MoAIWD and MoIT	28.5	16.5	22.5	
FO, radio and FUM	21.5	2.5	12.9	
Banks and NGOs	16	2	9.1	
None	24.5	60.5	42.5	
Total	**100**	**100**	**100**	

Note: *** indicate significance level at 1%.

4.2.6 Access to Training Services by Members and Non-members from FBOs

Farmer training is an important tool widely utilized by different stakeholders in Mulanje district to improve the capacity of smallholder farmers to enable them become market oriented. The results on access to training services by pigeon pea farmers are indicated in Table 15. The results indicate that 8.8 percent of the pigeon pea farmers had access to training from NGOs, MoIT and MoAIWD while 7.4 percent of the farmers accessed training from MoAIWD, 4.1 percent from the FO, FUM and fellow or lead farmers, 2.2 percent from fellow or lead farmers and 77.5 percent did not have access to training service from any other provider. For non-members of the FBOs, 1.5 percent accessed training from fellow or lead farmers, 0.5 percent received training from MoAIWD and 0.5 percent accessed training from NGOs, MoIT and MoAIWD. Conversely, 17 percent of the targeted members of FBOs accessed training from NGOs, MoIT and MoAIWD, 14.5 from MoAIWD, 8 percent received training from FBO, FUM and fellow or lead farmers and 3 percent were trained by fellow or lead farmers. The results indicate a significant difference at 1 percent level in the source of training services by both members and non-members of the targeted FBOs.

The focus area for the trainings that were provided by the different stakeholders was on production of pigeon peas, collective marketing, banking, value addition, group dynamics (leadership), cooperative member education, financial literacy (savings and investment) and gender, HIV and AIDS. Since a large percentage of FBO members had access to training services, their skills in terms of production and marketing were much better as compared to those of non-members. A study by Abdullah *et al*. (2017) indicated that the probability of farmer to participate in the market increases due to training. This is because farmers receiving training have the ability to produce more output and participate in the market because the training will increase their understanding.

Table 15: Sources of training services for members and non-members of FBOs

Provider of Training Service	**Member (%)**	**Non-members (%)**	**Pooled (%)**	χ^2
MoAIWD	14.5	0.5	7.4	96.285***
Fellow/Lead farmer	3	1.5	2.2	
FO, FUM and Fellow/Lead farmer	8	0	4.1	
NGOs, MoAIWD and MoIT	17	0.5	8.8	
None	57.5	97.5	77.5	
Total	**100**	**100**	**100**	

Note: *** indicate significance level at 1%.

4.2.7 Access to New Agricultural Technologies by Pigeon Pea Farmers from FBOs

Agricultural technology dissemination and adoption is important for farmers to increase productivity of farm enterprises. Results given in Table 16 indicate that 15.8 percent of the targeted pigeon pea farmers were getting new agricultural technologies from MoAIWD while 3.5 percent and 2.8 percent of the farmers accessed such technologies from NGOs and lead farmers. Moreover, 1.8 percent accessed the new agricultural technologies from the FBO and FUM while 74 percent did not have access to such technologies. For members of the FBOs, 21.5 percent of them accessed new agricultural technologies from MoAIWD as opposed to non-members with 10 percent of access from MoAIWD. However, 5 percent of the non-members had access to new agricultural technologies from lead farmers in the EPAs as opposed to 0.5 percent of the members who had accessed such technologies from the same source. Results in Table 16 indicate

significant difference at 1 percent level in the source of new agricultural technologies between members and non-members of the FBOs. The major technologies that were accessed by the targeted pigeon pea farmers in Mulanje district were mainly on ridge and plant spacing, use of improved seed varieties, pesticide and herbicide application, grading, conservation agriculture (CA), pit planting and irrigation.

Table 16: Provider of new agricultural technologies

Source or provider	Member (%)	Non-members (%)	Pooled (%)	χ^2
NGO	7	0	3.5	47.972***
MoAIWD	21.5	10	15.8	
MoAIWD and NGO	4	0.5	1.8	
FO and FUM	2	0	1	
Lead Farmer	0.5	5	2.8	
MoAIWD, lead farmer and FO	0.5	1	0.8	
None	64.5	83.5	74	
Total	100	100	100	

Note: *** indicates significance level at 1%.

4.3 Perception of Farmers towards Services Provided by FBOs in Promoting Pigeon Pea Enterprises

In this study, the perception of pigeon pea farmers towards services provided by FBOs was determined by using a five-point Likert type scale; strongly agree, agree, neutral, disagree and strongly disagree. In the five-point Likert scale, a value less than 3.39 indicated the extent to which farmers agreed with the constructs provided, between 3.40 and 3.79 indicated fairly agree to the constructs and greater than 3.80 indicated disagreement to the construct (Pihie, 2009) . The Cronbach's alpha value for reliability of the questions was found to be 0.912 which was higher than 0.7. This indicated that there was no biasness in the way the farmers were responding to the different questions to indicate their perception towards FO services (Teo and Fan, 2013), thus the questionnaire used as an instrument of data collection was reliable. The Friedman test as a non-parametric statistical test was used to rank the perception of farmers since it does not assume normal distribution of the data.

The results presented in Table 17 indicated that the responses that were provided by farmers under production services, marketing services and financial services were different and statistically significant at 1 percent level. On the other hand, the responses under advisory services were also different and statistically significant at 5 percent level.

Under production services, the perception that FBOs could help farmers to reduce the cost of input purchases along with transaction costs was ranked number 1 while the perception that FBOs helps to increase the production of among farmers was ranked last as number 3. This is probably because farmers need to reduce the cost of acquiring and buying inputs to enable their farm enterprise become more profitable. For marketing services, farmers ranked the perception that FBOs help to create opportunities for involvement in value addition activities which include processing as number 1 while the perception that FBOs help to improve access to post-harvest infrastructure was ranked last as number 5. This is because FBOs are able to receive grants in form of processing machinery for grading, packaging, sorting and changing the product form to meet buyer demands. Concerning advisory services, the perception that FBOs improve lobbying and advocacy of farmers was ranked number 1 while the perception that FBOs improve the management skills of farmers ranked number 2, as the last. This is because farmers in Mulanje regard lobbying and advocacy as being important especially when it comes to the minimum prices for their farm products. Regarding financial services, the perception that FBOs improves access to credit and the perception that FBOs improves the savings culture was ranked number 1 and number 1 as the last respectively. This is because credit is considered vital in improving the capital base of a farmer that can assist in buying inputs and paying for labour.

Table 17: Mean ranks of farmers perception towards services provided by FBOs

Category	Item	Mean Rank	Ranking
Production services	FBOs helps to reduce cost of input purchases along with transaction costs	2.21	1
	FBOs improves access to inputs by farmers in time	1.91	2
	FBOs helps to increase the production among farmers	1.89	3
	Chi^2	54.475	
	Asymp. Sig.	000	
Marketing Services	FBOs helps create opportunities for involvement in value-addition including processing	3.26	1
	FBOs improves access to reliable market information	3.15	2
	FBOs helps to increase the bargaining power of farmers	2.91	3
	FBOs helps to improve the farm income of pigeon peas farmers	2.87	4
	FBOs improves access to post-harvest infrastructure by farmers	2.81	5
	Chi^2	48.896	
	Asymp. Sig.	000	
Advisory services	FBOs improves lobbying and advocacy of farmers	1.53	1
	FBOs improves management skills of farmers	1.48	2
	Chi^2	4.444	
	Asymp. Sig.	0.035	
Financial Services	FBOs improves access to credit by farmers	1.60	1
	FBOs improves the savings culture of farmers	1.40	2
	Chi^2	56.140	
	Asymp. Sig.	0.000	

4.3.1 Farmers Perception towards Production Services Provided by FBOs

Results in Table 18 show that FBOs could help pigeon pea farmers to reduce cost of input purchases along with transaction costs with a mean value of 2.515. Among members of the targeted FBOs, the mean value was 1.97 indicating that members agreed that FBOs could help them to reduce cost of input purchases along with transaction costs unlike non-members with a

mean value of 3.06 indicating disagreement to such a point. The results indicate a significant difference in the perception of members and non-members towards cost of input reduction at 1 percent level. According to Pingali *et al.* (2005) and Markelova *et al.* (2009), transaction costs tend to decrease with scale. In this regard, formation of FBOs by farmers can help to reduce the costs for both producers and buyers.

The study results in Table 18 indicate that FBOs helped farmers to increase the production of pigeon peas and the mean value was 2.158. For both targeted members and non-members of the FBOs, the mean values were 1.53 and 2.29 respectively. This indicate that both members and non-members agreed that FBOs could help in increasing production of pigeon peas among farmers in Mulanje district. The results indicate a significant difference at 1 percent level. A study by Aref (2011) found that FBOs contribute greatly in enhancing self-sufficiency of major staple foods and strengthen farmers' household economy by facilitating market access and competitiveness, adapting their operations to agricultural technological innovations. In addition it is easy to provide organized farmers with modern farm technologies and training on the best production practices (Woldu *et al.*, 2013).

Overall, the results in Table 18 indicate that all farmers agreed that FBOs could help farmers to access inputs in time and the mean value was 2.148. Both member and non-members had a mean value of 1.88 and 2.42. This showed that all the targeted pigeon pea farmers agreed that FBOs could help farmers to access inputs in time. Perception towards improved access to inputs was significantly different at 1 percent level. According to Awotide *et al.* (2015), members of FBOs are able to get some inputs such as fertilizer, herbicides and improved seeds at subsidized rate or benefiting from bulk purchase, which lead to a reduction in cost. In addition, members also get moral supports from the other members in terms of planting and ploughing, thus constituting a reduction in cost.

Table 18: Perception towards production services provided by FBOs to pigeon pea farmers

Item	Members (n=200)		Non-Members (n=200)		Pooled (n=400)		t-value
	Mean	SD	Mean	SD	Mean	SD	
FBOs helps to reduce cost of input purchases along with transaction costs	1.97	1.061	3.06	1.115	2.515	1.216	10.019***
FBOs helps to increase the production among Farmers	1.53	0.844	2.29	1.270	2.158	1.250	11.728***
FBOs improves access to inputs by farmers in time	1.88	1.096	2.42	1.342	2.148	1.253	4.366***

*** = significant at 1% level

Likert-rating: <3.39 = agree, 3.40-3.79 = moderately agree and >3.80 = disagree

4.3.2 Farmers Perception towards Marketing Services provided by FBOs

As indicated in Table 19, the study found that FBOs could help pigeon pea farmers by creating opportunities for their involvement in value-addition including processing and the mean value was 2.88. For members of the targeted FBOs, the mean value was 2.27 indicating that members agreed to the point that FBOs could help in creating opportunities for involvement in value-addition including processing unlike non-members who fairly agreed with a mean value of 3.50. The perception towards creation of opportunities for involvement in value addition by farmers was significantly different at 1 percent level between members and non-members.

Regarding access to post-harvest infrastructure, the results indicate that FBOs could help pigeon pea farmers to access post-harvest infrastructures like warehouses and the mean value was 2.6 as shown in Table 19. For members of the targeted FBOs, the mean value was 1.79 unlike non-

members who had a mean value of 3.41. This indicated that members of FBOs agreed that FBOs help farmers to access post-harvest infrastructures while non-members fairly agreed to it. This was significantly different at 1 percent level. A study by Rwelamira (2015) found that FBOs help to improved farm level competitiveness through proper harvesting and post harvesting handling using modern technologies, grading, sorting, agro-processing as well as through the volume leveraging of procurement, packaging, storage and transport.

In addition, results in Table 19 indicate that the targeted pigeon pea farmers agreed that FBOs could help to increase the bargaining power of the farmers and the mean value was 2.618. For members of the targeted FBOs, the mean value was 1.93 while the non-members had a mean value of 3.31. This showed that both members and no-members agreed to that FBOs could increase the bargaining power of the pigeon pea farmers. However, the mean value for perception towards bargaining power was significantly different at 1 percent level. Biénabe and Denis (2005) found that it is necessary for local farmer groups to structure up at larger scale to gain real bargaining power to negotiate with traders and the authorities for better prices and a more favourable environment. However, bargaining power relies on both production scale and higher quality.

The study results in Table 19 indicate that the targeted pigeon pea farmers agreed that FBOs could help to improve access to reliable market information and farmer income and the mean values were 2.883 and 2.618 respectively. For members of the targeted FBOs, the mean values were 2.25 and 1.93 for both improved access to market information and increased farm income. On the other hand, non-members had 3.52 and 3.31 as mean values for both improved access to market information and increased farm income. The results indicate that both members and non-members agreed that FBOs help to improve farm income but no-members fairly agreed on that FBOs improve access to reliable market information. And this was significantly different at 1 percent level. According to Ojiagu *et al*. (2015), participation of farmers in agricultural cooperatives leads to increased income and improved access to market information.

Table 19: Perception towards marketing services provided by FBOs to Farmers

Item	Members (n=200)		Non-members (n=200)		Pooled (n=400)		t-value
	Mean	SD	Mean	SD	Mean	SD	
FBOs helps to create opportunities for involvement in value-addition including processing	2.27	1.109	3.50	0.891	2.88	1.179	12.224***
FBOs Improves access to post-harvest infrastructure by farmers	1.79	1.015	3.41	0.957	2.6	1.276	16.417***
FBOs helps to increase the bargaining power of farmers	1.97	1.107	3.46	0.961	2.715	1.276	14.377***
FBOs improves access to reliable market information	2.25	1.231	3.52	1.070	2.883	1.315	10.968***
FBOs Helps to improve the farm income of pigeon peas farmers	1.93	1.002	3.31	1.024	2.618	1.227	13.668***

*** = significant at 1% level

Likert-rating: <3.39 = agree, 3.40-3.79 = moderately agree and >3.80 = disagree

4.3.3 Farmers Perception towards advisory services provided by FBOs

Results given in Table 20 show that pigeon pea farmers agreed that FBOs could help to improve the management skills of farmers towards pigeon pea enterprise with an overall mean value of 2.103. This was the same for both members and non-members of the targeted FBOs who had a mean value of 1.59 and 2.62 respectively. This is because members of FBOs were able to easily obtain extension services and trainings from stakeholders (MoAIWD, banks and NGOs) that usually used group approach instead of individual approach in delivering such services to farmers as a way of reducing cost. The perception that FBOs could help to improve the management skills of farmers in FBOs is significantly different at 1 percent between the targeted members and non-members of the FBOs.

In addition, the results in Table 20 suggested that FBOs could help to improve the lobbying and advocacy of farmers and the mean value was 2.155. Although there is significant difference at 1 percent level in the perception towards improvement in lobbying and advocacy between members and non-members of the targeted FBOs, the results indicate that the farmers had a near unanimous view that their lobbying and advocacy on pigeon pea enterprise could improve significantly on account of membership to FBOs. Both members and non-members had a mean value of 1.69 and 2.63 respectively. This is because FBOs were able to demand improved delivery of extension services from MoAIWD and other stakeholders through employment of more extension staff and use of lead farmers as a way of assisting members in production and marketing activities. A study by Kachule and Dorward (2005) indicated that it is essential for farmers to work together as a recognised legalized entity for them to them to have a strengthened voice.

Table 20: Perception towards advisory services provided by FBOs to pigeon pea farmers

Item	Member (n=200)		Non-member (n=200)		Pooled (n=400)		t-value
	Mean	SD	Mean	SD	Mean	SD	
FBOs Improves management skills of farmers	1.59	0.898	2.62	1.310	2.103	1.233	9.129***
FBOs Improves lobbying and advocacy of farmers	1.69	0.922	2.63	1.320	2.155	1.231	8.255***

*** = significant at 1% level

Likert-rating: <3.39 = agree, 3.40-3.79 = moderately agree and >3.80 = disagree

4.3.4 FarmersPerception towards Financial Services provided by FBOs

From the results in Table 21, pigeon peas farmers disagreed with the point that FBOs could help to improve access to credit and the mean value was 3.048. For members of the FBOs, the mean value was 2.81 agreeing that FBOs could improve access to credit and non-members had a mean value of 3.29. Since Micro-finance institutions (OIBM, FINCA and FMB) required collateral to provide credit which most farmers did not have, FBOs promote the use of VSLs as an alternative to meet financial needs of members at a low interest rate. The study indicates a significant difference in the perception towards improved access to credit between the members and non-members at 1 percent level. Nzomoi *et al.*(2007) states that credit enables farmers, even those in low-income groups, to overcome their financial constraint and adopt innovations involving some cost. Besides, most financial institutions do not lend to farmers because of the risky nature of farming, and even those who do, will demand for collaterals which the farmers cannot afford individually.

The results in Table 21 indicate that the sampled pigeon pea farmers in Mulanje district agreed that FBOs could help to improve the saving culture of farmers. The mean value for the targeted members was 2.01 and that of non-members was 3.03 indicating that both members agreed non-members agreed that FBOs help to improve the saving culture of farmers. The results show a

significant difference at 1 percent level. This is because payment to members for produce sold through the FO could be made through the bank (FMB) which could make it possible for some members to save hence enabling such farmers to meet their financial needs in the next growing season. According to FAO (2008), financial services like savings and credit are crucial for farmers to access and sustain participation in dynamic markets and helps to bring liquidity into the supply chain.

Table 21: Perception towards financial services provided by FBOs to farmers

Item	Members (n=200)		Non-members (n=200)		Pooled (n=400)		t-value
	Mean	SD	Mean	SD	Mean	SD	
FBOs improves access to credit by farmers	2.81	1.184	3.29	0.932	3.048	1.090	4.460***
FBOs Improves the savings culture of farmers	2.01	1.077	3.03	0.997	2.518	1.157	9.875***

*** = significant at 1% level

Likert-rating: <3.39 = agree, 3.40-3.79 = moderately agree and >3.80 = disagree

4.4 Effect of Farmers Participation in FBOs on Gross Margin of Pigeon Pea Enterprise

The propensity score matching (PSM) technique was used to compute the effect of farmer participation in FBOs on the gross margin of pigeon pea enterprise. Gross margin of pigeon peas enterprises was measured per hectare basis for the 2015/16 agricultural season in Mulanje District, Malawi. Farmers were assigned 1 if they were members of a FO and 0 if they were non-members. Under the PSM technique, maximum likelihood estimates of probit model regression results in Table 22 indicate the factors influencing the decision of pigeon pea farmers to join a FO. The log likelihood for the fitted model of -199.24703 and p-value of 0.000 indicted that at least one of the regression coefficients was not equal to zero and that the explanatory variables that were included in the model were able to collectively explain the decision of farmers regarding the participation in FBOs in Mulanje district, Malawi. The Pseudo R^2 was 0.2401 which was above the statistical threshold of 20% (Aldrich and Nelson, 1984). This means that the explanatory variables were able to explain 24.01% of the dependent variable. The results for the first stage of the probit model revealed that EPA (location), age of the farmer, marital status, household head, years of schooling, distance to market and yield of pigeon peas had a significant effect on the decision of farmers to join FBOs.

Location (EPA) was statistically significant at 1 percent level. The results indicate that being in Thuchila and Milonde EPA reduced the probability of joining a FO by 24.1 percent and 18.8 percent respectively. This is because Thuchila and Milonde produce less pigeon pea as compared to Msikawanjala EPA which is the main area of pigeon production in Mulanje district. A study by Kaguongo *et al.* (2012) found out that location had an effect on adoption and intensity of adoption of an intervention.

Regarding marital status, being single decreased the probability of joining a FBO by 15.2 percent. This was statistically significant at 5 percent level. This was because most of the single farmers were young farmers who did not have the ambition of continuing with farming in the foreseeable future. This is linked to age of the farmer and the results showed that an additional increase in age of a farmer by one year led to an increase in the likelihood of participating in FBOs by 0.8 percent. The results were significant at 1 percent level. The participation of farmers in FBOs increases with age because the decision of participation depends on ones position in his family hierarchy. It is expected that major decisions are taken by older member of the household

which are necessary for the welfare of the household. This is in line with a study by Fisher and Qaim, 2012which found that age was exhibiting a positive effect on participation in cooperative among Banana farmers in Kenya. However, Goreux (2003) stated that younger farmers tend to be more willing to participate and adopt agricultural programmes than their older counterparts.

From the results, being a male-headed household increased the probability of participating in FBOs by34.4 percent. This was statistically significant at 1 percent level. This is because resources are mostly controlled by men who are the main decision makers in the household hence decisions on whether to join or not to join FBOs mainly depended on men. This is in line with a study by Mwangi *et al.* (2015) which found that male-headed households have higher market access than female-headed households this indicated that female-headed households are more constrained in accessing output market compared to male heads

An additional increase in years of schooling of the farmer by one year increases the probability of participating in FBOs by 3.8 percent. The coefficient for years of schooling is positive and significant at 1 percent level. The possible explanation for this is that farmers start formal education and continue going to school while continuing being a member of a FO in which farming is a full-time occupation. The finding of the study conforms to that of Bennin *et al*. (2008) who found that an increase in education level increases the probability of being a member of a FO. The study also stated that education is an important factor in influencing the decision of a farmer to become a member of a FO. However, Khan *et al.* (2012) reported a negative relationship between education and participation in agricultural activities by farmers.

The study found that an increase in distance to the market for pigeon peas by 1 kilometre, increased the probability of farmer's participation in FBOs by 1%. The coefficient for distance to market is statistically significant at 1% level. As the distance to pigeon pea output market increased, farmers were joining the FBOs because they wanted to share the transaction costs (cost incurred when searching and purchasing inputs, negotiation costs and cost of searching output market) with an aim of increasing the profit margins. According to Davis *et al.* (2012), the further away a farmer is from all year round gravel road and the district produce market infrastructure, the more likely they will join FBOs.

In relation to the yield of pigeon peas, an increase in the amount of pigeon peas produced by the farmer by 1 kilogram per hectare led to an increase in probability of participation by farmers in

FBOs by 0.1 percent. Thus, an increase in the amount of pigeon peas produced per hectare by the farmer led to an increase in the probability of joining FBOs. The coefficient for amount of pigeon peas sold is statistically significant at 1 percent level. This is because farmers were able to access better markets for the additional pigeon peas through FBOs. This is in line with a study by Njiru *et al.* (2015) which found that an addition of one cow to the smallholder farmer's herd led to an increase in the probability of a farmer being a member of a dairy cooperative.

Table 22: Factors influencing farmer's decision to join a Farmer-Based Organisations

Variables	dy/dx	Std. Error	P>z
EPA_dummy 2	-0.241	0.071	0.001***
EPA_dummy 3	-0.188	0.077	0.014***
Age	0.008	0.002	0.001***
Gender	-0.115	0.071	0.106
Marital Status	-0.152	0.066	0.020**
Household Head	0.344	0.124	0.005***
Household Size	0.013	0.015	0.377
Years of schooling	0.038	0.009	0.000***
Logoff-farm income	-0.007	0.005	0.154
Experience	-0.003	0.003	0.309
Distance to market	0.010	0.002	0.000***
Logcredit amount accessed	-0.005	0.013	0.681
Land allocated to Pigeon Peas	-0.056	0.038	0.145
Pigeon Pea Yield	0.001	0.000	0.001***
Number of observations		400	Pseudo R^2 0.2814
Wald $chi^2_{(11)}$		123.55	Prob > chi^2 0.000
Log pseudolikelihood		-199.24703	

Note: ***, ** indicate significance level at 1% and 5% respectively.

4.4.1 Results on Estimates of the Propensity Scores for Members and Non-members of FBOs

The results in Table 23 indicate that the overall estimated propensity scores lied between 0.007 and 1.000. The overall mean propensity score for the sampled farmers was 0.50 implying that the average probability of the sampled pigeon pea farmers in joining FBOs was 50 percent. For members of the FBOs, the propensity scores ranged from 0.103 to 1.000 while for non-members, the propensity scores ranged from 0.007 to 1.000. This shows that the region of common support lied between 0.103 to 1.000 dropping observations with propensity scores below 0.103 and above 1.000 (Appendix 3). As indicated in Table 23, 325 pigeon pea farmers comprising of 135 members and 190 non-members were sufficient to predict the effect of farmer participation in FBOs on the gross margin of pigeon pea enterprise for this study. This indicated that from the sampled 400 pigeon pea farmers, a total 75 pigeon pea farmers (65 members and 10 non-members) of FBOs were not considered for the matching exercise.

Table 23: Distribution of the Estimated Propensity Scores

Category	Observation	Mean	SD	Min	Max
Members	135	0.662	0.280	0.103	1.000
Non-Members	190	0.338	0.190	0.007	0.914
Pooled	325	0.500	0.289	0.007	1.000

4.4.2 Testing the Balance of Propensity Scores and Covariates

Before estimating the effect of farmer participation in FBOs on the gross margin of pigeon pea enterprise, the balancing properties of propensity scores ae checked to test whether the observations have the same distribution of the propensity scores or not. A study by Tolemariam (2010) indicated that balancing tests seeks to examine if at each value of propensity score, a given characteristic has the same distribution for he treated and comparison groups. The results in Table 24 show that six variables were had significant mean difference before matching while no variable indicated a significant mean difference after matching. This implies that there was a high degree of covariate balance between the sample members and non-members of FBOs. In this regard, the specification was successful in terms of balancing the distribution of covariates between matched members and non-members of FBOs.

Table 24: Test for balance of propensity score and covariates

	Before matching (n=400)			After matching (n=325)		
	Mean			Mean		
Variable	**Treated**	**Control**	**t-test**	**Treated**	**Control**	**t-test**
EPA_dummy 2	0.200	0.410	-4.67***	0.289	0.250	0.72
EPA_dummy 3	0.200	0.345	-3.29***	0.267	0.306	-0.72
Age	43.555	37.795	4.23***	42.222	42.368	-0.09
Gender	0.320	0.280	0.87	0.289	0.282	0.12
Marital Status	2.330	2.350	-0.27	2.378	2.360	0.20
Household Head	1.230	1.175	1.37	1.237	1.233	0.08
Household Size	5.715	5.385	1.64	5.667	5.784	-0.48
Years of schooling	6.495	5.335	3.22***	6.096	6.127	-0.07
Logoff-farm income	4.922	4.666	0.43	4.263	3.947	0.45
Experience	7.955	8.495	-0.64	8.163	8.702	-0.50
Distance to market	27.118	3.186	9.63***	6.782	5.891	0.52
Logcredit amount accessed	0.670	0.525	0.63	0.487	0.436	0.20
Land allocated to Pigeon Peas	0.726	0.779	-0.59	0.727	0.692	0.36
Pigeon Pea Yield	302.880	193.370	4.75***	256.350	254.640	0.06

Note: ***: Significant at 1% level

4.4.3 Chi-square test for joint significance of variables

The similarity in distribution of covariates X after matching was evidenced by a low pseudo R^2 that dropped from 28.1% to 0.5% after matching in Table 25. Furthermore, the p-values of the likelihood ratio tests indicate that the joint significance of the covariates was rejected after matching where as it was not the case before matching. The low pseudo R^2, low standardized bias and the insignificant p-values of the likelihood ratio test after matching shows that the specification of the propensity was effective in terms of balancing the distribution of covariates between the two members and non-members of the FBOs.

As recommended by Rosenbaum and Rubin (1985) a standardized difference of 20% or more should be viewed as large. As indicated in Table 25, the standardize mean difference for overall covariates used in the propensity score is reduced from about 25.9 before matching to 3.7 after matching. The results indicate that there were statistically significant differences between the t-tests of the chosen variables before matching. The balancing of all observable variables between members and non–members of FBOs was achieved after matching.

Table 25: Chi-square test for joint significance of variables

Sample	Ps R2	LR chi2	P>chi2	Mean bias
Unmatched	0.281	156.02	0.000	25.9
Matched	0.005	1.86	1.000	3.7

4.4.4 Matching Algorithm: Estimation of Average Participation Effect (ATT)

Average treatment on treated (ATT) was calculated using the kernel, stratification, radius and nearest neighbour matching techniques. The counterfactual group for analysis were pigeon pea farmers who were not members of FBOs. As indicated in Table 26, the results obtained under stratification matching were considered due to the largest treatment effect on the treated and produced balanced propensity score and covariates after matching. The results indicate that there was a significant difference at 5 percent level on gross margin of pigeon pea enterprise between members and non-members of the FBOs after controlling for all observables. On average, Farmers that were members of FBOs had higher gross margin of pigeon pea enterprise as compared to non-members of the FBOs.

The gross margin for members and non-members of the FBOs differed by MK25, 621.45 per hectare. The increase in gross margin for members could be attributed to supporting services that were accessed from the FO such as access to seed, access to extension services, access to training and technical backstopping relating to pigeon peas production and marketing. This is in line with a study by Kabuli (2013) which found that cooperative members had higher gross margins than non-members.

Table 26: Estimation of Average Participation Effect (ATT): Matching Algorithms

Matching Algorithm	Treated	Control	ATT	Std. Err.	t-value
Kernel Matching	200	188	13,114.95	9,913	1.323**
Stratification matching	200	188	25,621.45	12,913.61	1.984**
Radius Matching	44	51	13,338.55	11,198.42	1.191**
Nearest neighbour matching	200	72	6,552.86	17,449.20	0.376

4.4.5 Sensitivity analysis with Rosenbaum bounds on probability values

The results in Table 27 shows the Mantel-Haenszel bounds (Mhbounds) that were computed to check for sensitivity of estimated average treatment effects and critical hidden bias. The hidden bias comes in due to unobserved factors which influence the participation decision (Green, 2012). At the level where the bound is equal to 1, there were no unobserved factors. The bounds were increased 0.05 and the various levels of bounds indicated the degree at which the unobserved positive or negative selection effect would become significant. In this regard, the test statistic under Q_mh+ and Q_mh- gave similar results across all bound of odds assigned due to unobserved factors. The negative values of Q_mh+ showed a negative selection bias where pigeon pea gross margins was low irrespective of farmer participation in FBOs. However, selection bias was not significant at different bound levels in the case of overestimation and underestimation of the treated effect as indicated by P_mh + and P_mh- values. Result on the table further show that the study was insensitive to bias that would double or triple the odds of change in the level of gross margin of pigeon peas because of participation in FBOs.

Table 27: Mantel-Haenszel (1959) Bounds for pigeon pea gross margin

Gamma	Q_mh+	Q_mh-	p_mh+	p_mh-
1	.	.	.	.
1.05	-0.083047	-0.083047	0.533093	0.533093
1.1		-0.083047		0.533093
1.15	-0.083047	-0.083047	0.533093	0.533093
1.2	-0.083047	-0.083047	0.533093	0.533093
1.25	-0.083047		0.533093	
1.3	-0.083047	-0.083047	0.533093	
1.35	-0.083047		0.533093	0.533093
1.4				
1.45	-0.083047	-0.083047	0.533093	0.533093
1.5	-0.083047	-0.083047	0.533093	0.533093
1.55	-0.083047	-0.083047	0.533093	0.533093
1.6	-0.083047	-0.083047	0.533093	0.533093
1.65	-0.083047		0.533093	
1.7	-0.083047	-0.083047	0.533093	0.533093
1.75	-0.083047		0.533093	
1.8	-0.083047	-0.083047	0.533093	0.533093
1.85		-0.083047		0.533093
1.9	-0.083047	-0.083047	0.533093	0.533093
1.95		-0.083047		0.533093
2	-0.083047	-0.083047	0.533093	0.533093

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Farmers that were members of FBOs were found to be older, more educated and travelled longer distances to markets as compared to farmers that were not members. In addition, the gross margin for pigeon peas for members of FBOs was higher than that of non-members. Both members and non-members of FBOs had different sources of inputs, extension services, credit, training, new agricultural technologies and the preferred output market for pigeon peas. On perception towards agribusiness service delivery, farmers agreed FBOs help in improving access to production, marketing, advisory and financial services that are required to promote the pigeon pea enterprise.

Besides, the location of a farmer, age, marital status, years of schooling, distance to market, yield of pigeon peas and household head were important factors as they depicted a significant influence on the decision by farmers to join FBOs whose major enterprise was pigeon pea. Lastly, it was found that participating in FBOs increased the gross margin of pigeon peas. Farmers who joined FBOs obtained higher gross margins per hectare for pigeon pea enterprise than those who did not and the difference in the gross margin was MK25, 621.45.

5.2 Recommendations

Efforts should be made by all stakeholders to consider age, years of schooling, distance to market, access to inputs, access to extension services, access to credit, access to training and access to new agricultural technologies as some of the important factors for promoting agribusiness development in Malawi through FBOs.

Furthermore, the findings raised the need for improving the capacity of FBOs through trainings for efficient delivery of agribusiness service delivery to members especially production, marketing, advisory and financial services that are required to promote the pigeon pea enterprise. Lastly, stakeholders in the agricultural sector can enhance commercialisation of agriculture in Malawi through promotion of strategic collective action as they improve the livelihood of smallholder farmers through increased farm income.

5.3 Suggestions for Further Research

While this research covered only the role of Farmer-Based Organisations in promoting pigeon pea enterprise in Mulanje district, the study can be conducted to many districts in Malawi targeting pigeon pea enterprise and other enterprises of economic importance. Farmers are also using the Warehouse Receipt System (WRS) which is being spearheaded by Auction Holdings Commodity Exchange Limited (AHCX) and Agricultural Commodity Exchange (ACE). Hence, it will be important to conduct research on the effect of such market arrangements on collective marketing and the rate of commercialization among smallholder farmers in Malawi. It would also be essential for future research to focus on the influence of farmers organizations on the adoption of climate smart technologies among smallholder farmers in Malawi.

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APPENDICES

Appendix 1: Questionnaire

Questionnaire Number: _____ Date: _____

Dear respondent,

This questionnaire is meant to provide data for an academic research on, *Role of Farmer-Based Organisations in Promoting Pigeon Peas Enterprise in Mulanje District, Malawi*. This will inform recommendations to enhance sustainability of market oriented Farmer-Based Organisations (FBOs). Any contribution given will be highly appreciated and your responses will be treated with utmost confidentiality. Thank you.

A. IDENTIFICATION

Enumerators Name	EPA	Section

B. PERSONAL DATA FOR RESPONDENTS

Item	Response
1. Name of respondent	
2. Gender of respondent (1=Male, 0=Female)	
3. Age of respondent (years)	
4. Marital status of the respondent (1=Single, 2=Married, 3=Divorced, 4=Widowed, 5=Never married)	
5. Household size (including respondent)	
6. Household head	
7. Occupation of respondent apart from farming	
8. Years you have attended school altogether	
9. Relationship of the respondent to the household head	
10. Total household off-farm income for the 2015-2016 season	
11. Years of running the farm business enterprise	

C. FARMER-BASED ORGANISATIONS MEMBERSHIP

Item	Response
12. Are you a members of an FO? 1=Yes ***(go to 13-16)***, 2=No ***(go to 16)***	
13. What is the name of FO?	
14. How did you become a member? 1=Entrance fee,2=Share,3=annual subscription	
15. What is the amount paid for question 14 (if any)?	
16. What is the period of membership to the FO (years)	
17. Can you indicate why you decided (not) to become a member of the FO?	

D. MARKETING SERVICES

18. Do you access any market information for products and inputs through the Farmer-Based Organisations _____(1=Yes, 2=No)
19. If yes? Fill the information in the table below.

Type of information *(Tick where applicable)*	**Information Provider**	**Cost (MK)***(if any)*
Price [ ]		
Quality [ ]		
Market Availability [ ]		
Production technologies [ ]		
Others *(specify)* [ ]		

Source: members, radio, newspaper, mobile phone, Govt, research institute, other (specify_____)

20. What is the level of satisfaction of the information obtained? _____ (1=Useful, 2=Neutral, 3=Not Useful)
21. Explain for the choice in question 21 above

_____

22. Do you access to output market for pigeon peas through the FO? ____ (1=Yes, 2=No)
23. If yes? Fill the information in the table below.

Name of Buyer *(Tick where applicable)*	**Quantity**	**Unit Price (MK)**	**What is the form of payment (1=direct payment, 2=advancement payment, 3=delayed payment)**
Auction Market [ ]			
NGO [ ]			
Private companies [ ]			
Local Traders [ ]			
Others *(specify)* [ ]			

Unit of measurement: Kgs, pales, others (Specify_____)

24. What is the level of satisfaction of the output markets?_ (1=Good, 2=Neutral, 3=Poor)
25. Explain for the choice in question 24 above _____
26. What is the distance to the market (km)? _____

E. PRODUCTION SERVICES

27. Have you accessed any inputs from or through the FO? _____ (1=Yes, 2=No)
28. If yes? Fill the information in the table below.

Name of provider	Type of Input	Unit of measurement	Quantity	Unit Price (MK)	Total Value (MK)

Unit of measurement: litres, Kgs, pales, others (Specify_____)

29. What is the level of satisfaction of this service? _____ (1=Good, 2=Neutral, 3=Poor)

30. Explain for the choice in question 29 above _____

F. FINANCIAL SERVICES

31. Have you accessed any credit from or through the FO? _____ (1=Yes, 2=No)

32. If yes? Fill the information in the table below.

Source*(Tick where applicable)*	**Name of Institution**	**Amount accessed**	**Interest**	**Amount used on pigeon peas enterprise (MK)**
Bank [ ]				
FO [ ]				
NGO [ ]				
Government [ ]				
Fellow Farmer [ ]				
Others *(specify)* [ ]				

33. Have you finished paying back?_____ (1=Yes, 2=No)

34. If no, why have you not finished? _____

35. What is the level of satisfaction of this service? _____ (1=Good, 2=Neutral, 3=Poor)

36. Explain for the choice in question 35 above _____

G. ADVISORY SERVICES

37. Do you access extension services through the FO?_____ (1=Yes, 2=No)

38. If yes? Fill the information in the table below.

Institution*(Tick where applicable)*	**Services obtained**	**Cost (if any)**
Bank [ ]		
NGO [ ]		
Government [ ]		
Farmer to Farmer [ ]		
FO [ ]		
Others *(specify)* [ ]		

39. What is the level of satisfaction of this service? ___(1=Good, 2=Neutral, 3=Poor)

40. Explain for the choice in question 39 above _____

41. Do you access training services through or from the FO?_____ (1=Yes, 2=No)

42. If yes? Fill the information in the table below.

Institution *(Tick where applicable)*	**Area of focus of the Training**	**Cost (if any)**
Bank [ ]		
NGO [ ]		
Government [ ]		
Farmer to Farmer [ ]		
FO [ ]		
Others *(specify)* [ ]		

43. What is the level of satisfaction of this training? __(1=Good, 2=Neutral, 3=Poor)

44. Explain for the choice in question 43 above _____

45. Have you accessed any new technologies through your FO? _____ (1=Yes, 2=No)

46. If yes? Fill the information in the table below.

Institution*(Tick where applicable)*	**Technologies obtained**	**Cost (if any)**
NGO [ ]		
Government [ ]		
Others*(specify)* [ ]		

47. How do you perceive these technologies? _____(1=Useful, 2=Neutral, 3=Not Useful)

48. Explain for the choice in question 47 above _____

H. DETERMINATION OF GROSS MARGIN FOR PIGEON PEAS ENTEPRISE

49. What is the total size of your land for farming?_____*(in ha)*

50. What is the area of land allocated to pigeon peas production? _____ *(in ha)*

51. What is the quantity of pigeon peas that was produced and sold in the 2015-2016 season?

Total Quantity Produced (Kgs)	Total Quantity Sold (Kgs)	Price per unit (MK)	Gross Income(MK)

52. What are variable costs for pigeon peas incurred in the 2015-2016 season

Input	Unit Measure	Quantity	Cost per unit (MK)	Total Costs (MK)
Seed				
Pesticides				
Herbicides				
Sacks				
Transport				
Casual Labour				
Land clearing				
Planting				
Harvesting				
Weeding				
Herbicide application				
Others				
Total variable costs				

I. PERCEPTION OF FARMERS TOWARDS SERVICES PROVIDED BY FBOs IN PROMOTING PIGEON PEA ENTEPRISE

53. Indicate the perception of farmers towards services provided by FBOs in promoting pigeon peas enterprises.

	1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree	1	2	3	4	5	*Comment*
	Production Services						
1	Helps to reduce costs of input purchases along with transaction costs						
2	Helps to increase the production among farmers						
3	Improves access to inputs by farmers in time						
	Marketing Services						
1	Helps to create opportunities for involvement in value-addition including processing						
2	Improves access to post-harvest infrastructure by farmers						
3	Helps to increase the bargaining power of farmers						
4	Improves access to reliable market information						
5	Helps to improve the farm-income of pigeon peas farmers						
	Advisory Services						
1	Improve farm management skills of farmers						
2	Improves lobbying and advocacy of farmers						
	Financial Services						
1	Improves access to credit by farmers						
2	Improves the savings culture of farmers						

54. Do you have anything to add which has not been highlighted?_____ (1=Yes, 2=No)

55. If yes? Explain. _____

THANK YOU

Appendix 2: Probit Model results on factors influencing farmer participation in FBOs

```
Probit regression                               Number of obs     =        400
                                                Wald chi2(14)     =     123.55
                                                Prob > chi2       =     0.0000
Log pseudolikelihood = -199.24703               Pseudo R2         =     0.2814
```

Membership	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
EPA_dummy2	-.6136387	.1849394	-3.32	0.001	-.9761134	-.2511641
EPA_dummy3	-.4754386	.1968352	-2.42	0.016	-.8612285	-.0896488
Age	.0208283	.0060044	3.47	0.001	.0090599	.0325968
gender	-.2893114	.1794211	-1.61	0.107	-.6409703	.0623474
MARITALSTATUS	-.3853146	.1663651	-2.32	0.021	-.7113843	-.0592449
HHH	.8723782	.3132773	2.78	0.005	.258366	1.48639
HHS	.0334193	.0377824	0.88	0.376	-.0406329	.1074715
SCHOOLINGYEARS	.0964032	.0224051	4.30	0.000	.0524899	.1403164
Logoffincome	-.0176432	.0123826	-1.42	0.154	-.0419127	.0066263
FARMINGEXP	-.0088583	.0087105	-1.02	0.309	-.0259306	.008214
MARKETDISTANCE	.026238	.0042185	6.22	0.000	.01797	.034506
LogCREDITAMOUNT	-.0137151	.0333727	-0.41	0.681	-.0791244	.0516942
PPLAND	-.141085	.0966427	-1.46	0.144	-.3305013	.0483313
YIELD2015	.0011703	.000348	3.36	0.001	.0004883	.0018524
_cons	-1.616647	.42591	-3.80	0.000	-2.451415	-.7818782

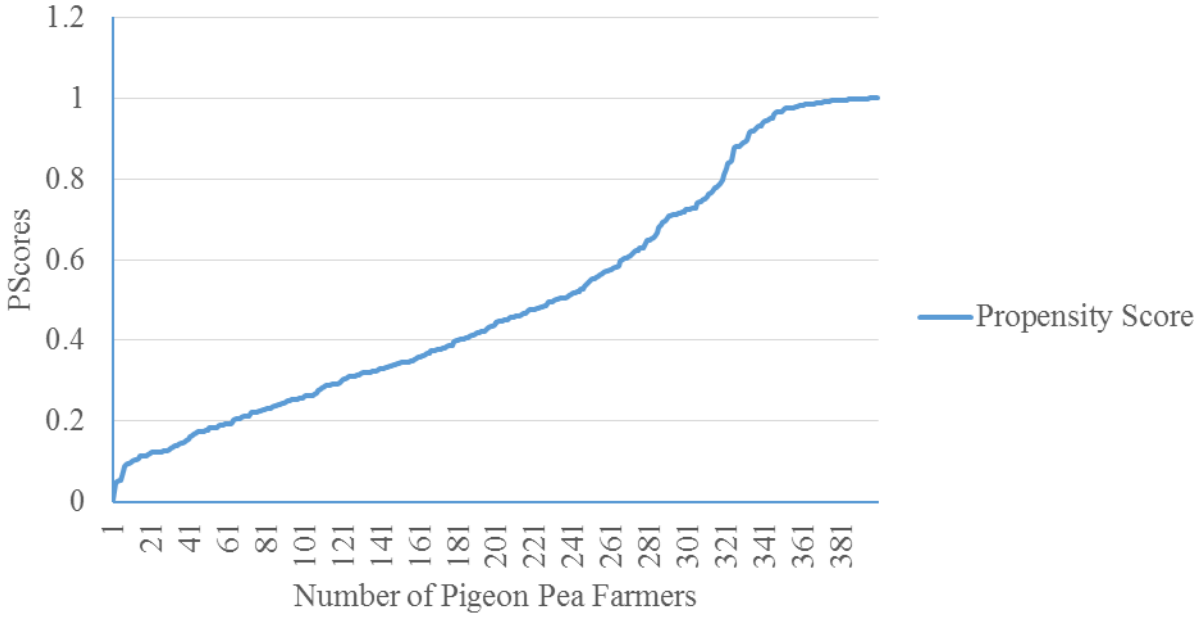
```
.
. mfx

Marginal effects after probit
      y  = Pr(Membership) (predict)
         =  .55816588
```

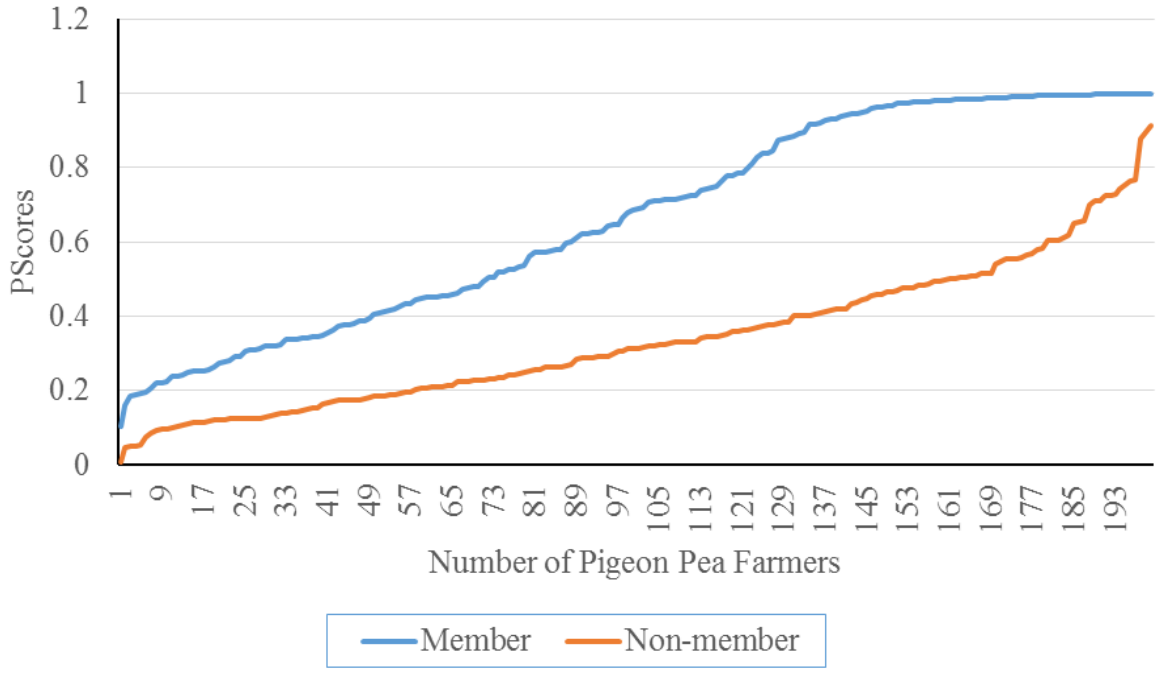
variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
EPA_du~2*	-.2409361	.07057	-3.41	0.001	-.379256	-.102616	.305
EPA_du~3*	-.187767	.07663	-2.45	0.014	-.337963	-.037571	.2725
Age	.0082208	.00237	3.47	0.001	.00358	.012861	40.675
gender*	-.1145713	.07094	-1.62	0.106	-.25361	.024467	.3
MARITA~S	-.1520815	.06563	-2.32	0.020	-.280717	-.023446	2.34
HHH	.3443228	.12354	2.79	0.005	.102187	.586459	1.2025
HHS	.0131904	.01492	0.88	0.377	-.016051	.042432	5.55
SCHOOL~S	.0380498	.00882	4.31	0.000	.020764	.055335	5.915
Logoff~e	-.0069637	.00489	-1.43	0.154	-.01654	.002613	4.79365
FARMIN~P	-.0034963	.00344	-1.02	0.309	-.010236	.003244	8.225
MARK~NCE	.010356	.00163	6.36	0.000	.007163	.013549	15.1516
LogCRE~T	-.0054133	.01317	-0.41	0.681	-.031229	.020402	.597682
PPLAND	-.0556855	.03817	-1.46	0.145	-.130503	.019132	.75215
YIE~2015	.0004619	.00014	3.37	0.001	.000193	.000731	248.125

```
(*) dy/dx is for discrete change of dummy variable from 0 to 1
```

Appendix 3: Propensity scores pigeon pea farmers



Propensity score line graph for members and non-members of FBOs



```
.
. mhbounds GM, gamma (1 (0.05)2)

Mantel-Haenszel (1959) bounds for variable GM

Gamma          Q_mh+      Q_mh-      p_mh+      p_mh-
----------------------------------------------------
    1              .          .          .          .
 1.05       -.083047   -.083047   .533093   .533093
  1.1              .   -.083047          .   .533093
 1.15       -.083047   -.083047   .533093   .533093
  1.2       -.083047   -.083047   .533093   .533093
 1.25       -.083047          .   .533093          .
  1.3       -.083047          .   .533093          .
 1.35       -.083047   -.083047   .533093   .533093
  1.4              .          .          .          .
 1.45       -.083047   -.083047   .533093   .533093
  1.5       -.083047   -.083047   .533093   .533093
 1.55       -.083047   -.083047   .533093   .533093
  1.6       -.083047   -.083047   .533093   .533093
 1.65       -.083047          .   .533093          .
  1.7       -.083047   -.083047   .533093   .533093
 1.75       -.083047          .   .533093          .
  1.8       -.083047   -.083047   .533093   .533093
 1.85              .   -.083047          .   .533093
  1.9       -.083047   -.083047   .533093   .533093
 1.95              .   -.083047          .   .533093
    2       -.083047   -.083047   .533093   .533093

Gamma : odds of differential assignment due to unobserved factors
Q_mh+ : Mantel-Haenszel statistic (assumption: overestimation of treatment effect)
Q_mh- : Mantel-Haenszel statistic (assumption: underestimation of treatment effect)
p_mh+ : significance level (assumption: overestimation of treatment effect)
p_mh- : significance level (assumption: underestimation of treatment effect)
```